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P R O C E E D I N G S

of the

SELECT COMMITTEE APPOINTED BY THE ONTARIO LEGISLATURE  
TO ENQUIRE INTO CERTAIN MATTERS AND LEGISLATION  
REGARDING SMOKE CONTROL AND AIR POLLUTION IN ONTARIO.

Mr. A. H. Cowling, Chairman.

Dr. F. A. Evis, Secretary.

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Tuesday, October 23rd, 1956,

NEW YORK, N.Y.

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R. C. Sturgeon,  
Official Reporter,  
Parliament Buildings,  
Toronto, Ontario.





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T H I R T Y - T H I R D   D A Y

New York, N.Y.,  
Tuesday, October 23rd, 1956,  
9:45 o'clock, a.m.

- - - -

The further proceedings of this Committee  
reconvened pursuant to adjournment.

Mr. A. H. Cowling, Chairman,  
Presiding.

PRESENT:

Hon. Mr. Kelly,  
Messrs. Morningstar,  
Elliott,  
Murdoch,  
Gordon,  
Thomas (Oshawa),  
Dr. F. A. Evis, Secretary.

APPEARANCES:

Mr. H. A. Belyea,	Air Pollution Control Officer, Metropolitan Toronto.
Mr. S. L. Hanauer,	Deputy Commissioner, Depart- ment of Air Pollution Control, City of New York.
Dr. M. B. Jacobs,	Director, Department of Air Pollution Control Laboratory, City of New York.





Mr. K. Kowald, Secretary, Department of  
Air Pollution Control,  
City of New York.

Mr. Harold Blicksman, Director, Bureau of  
Inspection.

Mr. Leo Flood, Division of Engineering.

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---The meeting at the office of the New York City  
Department of Air Pollution Control was resumed  
today at 9:45 a.m., when a number of questions  
were put to and answered by Mr. Deputy Commissioner  
Hanauer and Dr. Jacobs.

- - - -

MR. HANAUER: We would like to have garbage  
collection instead of incinerators. People tell you  
that the results of land fill operations are entirely  
satisfactory, and, if you have areas -- which we have --  
along the seaboard which are marshy and extend for  
acres and acres, the use of refuse for that purpose  
creates eventually useable land.

In the alternative, we find the modern type  
of destructive incinerator, with proper engineering  
and proper controls, gives you completely odourless  
combustion, and reduces fly ash and dust to permissible  
limits. The stuff that gets out of the modern  
incinerator is so light and fluffy that it takes a  
long time to settle and eventually becomes dissipated.



This can be reduced to three or four or five percent. of the total solids that go in.

MR. ELLIOTT: You fellows have had more experience with apartment buildings than anyone in the world, as far as that goes, and personally I would be very interested in getting to know all we can about the apartment problem, because I am sure apartments are becoming popular, not only here, but all over our country as well.

MR. HANAUER: You have to decide which boy you are going to keep your eye on. I was in the real estate business all my life until I came in here, and I am still in it, and from the operating, private, point of view of management of apartment houses, there is nothing cheaper to operate than an incinerator. The tenants throw their garbage in, and the superintendent lights it up, and forgets it.

But I am now here, charged with the duty of reducing air pollution, and I think these things are an abomination.

MR. BELYEA: Have you ever thought of tackling it by estimating the damage done by each unit?

MR. HANAUER: Yes. As a matter of fact, our laboratory has made tests for us, and we have





estimated that incinerators, uncontrolled as they are now, emit about two thousand tons of soot and fly ash into the air of this city.

MR. BELYEA: Can you bring that down to about how much damage is done by one apartment house?

MR. HANAUER: Damage to whom?

MR. BELYEA: You have not estimated the total damage done to the city. You have an estimate of the total number of tons emitted. Can you break that down so as to say that one apartment is doing, say, \$5,000. damage a year in air pollution, and would that justify charging that apartment some such sum to pay for the garbage collection?

MR. HANAUER: I would not want to attempt to do that, because I do not think it is a feasible way.

Further than that, there is no way of evaluating the nuisance factor that is involved in the improper incineration of garbage. I came down the East River Drive this morning, and outside the public housing development, which is north of the Brooklyn Bridge, as we were waiting there on the ramp for the traffic light to change, I said to my driver, "Do you smell what I smell?". He said, "Yes". It is a very strong garbage smell. Where do you think it comes from?"





It was obvious where it came from, because there are four incinerators burning in this development, and the down-draught at this point was bringing the smoke and soot and dust and odours right where we were parked.

How do you evaluate the nuisance value to the people in this development from the nauseous smell of this stuff?

MR. BELYEA: I know it would be only a "guesstimate".

MR. HANAUER: How can you?

MR. BELYEA: If you could put some value on it, you could say that these people are doing so much damage; they are responsible for it, should they not pay for it?

MR. HANAUER: You can figure it out for yourself. We have said many times that the damage to the citizens of New York is somewhere near \$10. and \$20. per capita for all forms of air pollution.

MR. ELLIOTT: In your radio talk, you said \$8. to \$10., did you not?

MR. HANAUER: No, I said \$10. to \$20.

MR. ELLIOTT: Somebody else suggested \$8. to \$10., did they not?

MR. HANAUER: Dr. Greenburg thinks that \$12.



is the right figure.

I think you can take any number from \$8. to \$25. In fact, there are some people who think it is \$45. per capita, but certainly \$10. is a very low estimate of cost to the city for dirty air of one kind or another. There are eight million people in this city.

MR. ELLIOTT: In this area?

MR. HANAUER: In this city.

MR. ELLIOTT: Not the area?

MR. HANAUER: No, this is just in this city.

MR. ELLIOTT: The area is probably sixteen or eighteen millions.

MR. HANAUER: At least; or twenty millions. I would include part of New Jersey, Nassau County and Westchester.

MR. BELYEA: How many square miles area in that area?

MR. HANAUER: 324 square miles. If you want to divide eight million times ten, estimating it at \$10., by ten thousand apartment house incinerators, and assume as a guess, that those ten thousand apartment house incinerators serve an average of twenty families each -- this is a pure guess -- you will come up with a number, and if you then make a further





estimation -- and this is very, very hypothetical -- that incineration damage is perhaps somewhere between 15% and 30% of the total that we are talking about -- and I am giving you this wide range -- I do not think anybody knows how you can come up with a number which represents the cost per family of air pollution due to incinerators.

MR. ELLIOTT: Do the hotels do the same thing? Do they incinerate their own garbage?

MR. HANAUER: The hotels do not have fuel fed incinerators. They may have the destructive feed incinerators, where the porter or fireman feeds the rubbish into the incinerator, but most have their rubbish removed by private truck.

It is not part of the city's obligation . It is the same with restaurants.

MR. THOMAS: Do you do any land filling?

MR. HANAUER: Yes, there is considerable land filling done. There are two places on Staten Island, and a couple on the north shore. Whether there are any more, I do not know.

We have nothing to do with them, except when fire starts in one of these land fill operations, and somebody complains about something, we usually hear about it first, and then Sanitation or the Fire



Department go and put the fires out.

MR. ELLIOTT: Do you have tractors and bulldozers on these dumps all the time?

MR. HANAUER: Yes. These are carefully operated.

MR. ELLIOTT: The engineering is to the last letter?

MR. HANAUER: Yes. They trench and cover, and trench and cover, and keep this going on.

MR. ELLIOTT: You cannot do that on marshy land, can you?

MR. HANAUER: Well, they dump in marshy land. They keep building themselves out.

MR. THOMAS: You have reclaimed quite a lot of land in recent years?

MR. HANAUER: As a matter of fact, there are a lot of operations down along the shore here where they have built out considerable acreage and are still doing it.

MR. MORNINGSTAR: You have the same in Hamilton.

MR. ELLIOTT: Half of the north end of the city is land fill, and there is going to be a day when it is really going to pay good dividends. Incinerators cost ninety cents, where land fill





costs about sixty. That is what we have found.

MR. HANAUER: I think the figures we have heard mentioned are less than that.

MR. ELLIOTT: Personally, I think that garbage is going along with air pollution to a greater extent than anybody realizes. I know that in Hamilton we had a terrific problem with garbage dumps getting on fire, and they gave off the most evil stench in the world, and there is no way of putting them out. They burn for days and weeks.

MR. HANAUER: Let me explain the responsibilities of Mr. Blicksman and Mr. Flood.

The Bureau of Inspection, of which Mr. Blicksman is the Director, is the Department's contact with the public. All complaints go to Mr. Blicksman's division, and his inspectors are out in the field, I hope, all the time, following them down, seeing the complainant, seeing the offender, and proceeding in accordance with whatever the facts indicate.

Mr. Blicksman's division also makes special surveys.

It is now completing a survey of all the incinerators in this city. We have counted up around eight thousand at the moment; we think we shall have



close to then thousand. We have the address of each, the number of families it serves, the name of the device, and other data. We expect this will be a reference file for us as we go along.

Mr. Blicksman's inspectors also help in an educational programme to distribute to the owners and other interested people our guides on good operation. They instruct the operators of buildings on the proper operation of their equipment, and give hints on its maintenance.

Mr. Flood's Division of Engineering is the place where all plans are filed for new equipment, all fuel-burning or process equipment of any kind that does, or has a tendency to emit pollutants into the air. These installations, with a few exceptions, have to be filed -- Mr. Flood's engineers examine the plans to be sure they conform with our requirements; and when they are approved, the installer gets a permit to install.

When the installation is finished, Mr. Flood has another group of men to inspect the job to be sure it was installed in accordance with the plans, and to observe its preliminary operation.

THE CHAIRMAN: Does the Building Commissioner do the same thing?





MR. HANAUER: Not as far as foul air or pollution equipment is concerned. The Building Department restricts itself entirely to structure and exit codes, and other fire and safety requirements.

MR. BELYEA: Can you withhold construction of any building if the equipment to eliminate air pollution is not in accordance with your specifications?

MR. HANAUER: Well, we withhold our permit insofar as the air pollution department of the equipment is concerned. The building could go up, but if the boiler we examined did not conform to our requirements, we would not issue a permit for the installation of the boiler.

THE CHAIRMAN: Before they open the doors for business, if they do not operate in accordance with your specifications, they do not operate?

MR. HANAUER: They do not get a certificate of operation for the building, do you mean?

THE CHAIRMAN: They have to abide with your rulings?

MR. HANAUER: Yes. Mr. Flood is also engaged in keeping the Commissioner abreast of new developments in the field. He makes surveys of industry, and he will probably tell you a lot of things which I do not



remember.

THE CHAIRMAN: In connection with your inspectors; how are these men qualified?

MR. HANAUER: The minimum of educational requirements is high school or its equivalent, and experience. We require four years of inspectorial experience with an enforcement agency where air pollution or industrial hygiene is a factor.

Public health is a factor, or, in lieu of that, five years' experience in combustion -- handling, designing, operation and installation of combustion or air-cleaning equipment.

MR. ELLIOTT: They must pay pretty fair salaries if they want all that.

MR. HANAUER: As I have just recited, these are our present, newly revised requirements. We have members of our staff who do not meet these requirements.

MR. BELYEA: They have the practical experience?

MR. HANAUER: They have the practical experience. The base wages are \$4,250. per annum.

MR. ELLIOTT: That is a pretty high standard you are setting for a man to start on a job like that.

MR. HANAUER: This is a bone of contention. We think we need men with these qualifications.



MR. ELLIOTT: It is not a very large starting rate.

THE CHAIRMAN: We were asking yesterday about the coal burning locomotives. Of course, you do not have any, because in this city they are electric.

MR. BLICKSMAN: Electric or diesel.

THE CHAIRMAN: I want to ask you two questions. Are there any problems in connection with diesels; and also, the problem of the ships tying up at the docks.

MR. BLICKSMAN: There are some problems with the diesels, primarily that of odour.

The railway right-of-way is in close proximity to certain buildings and structures.

We do not have too many such areas in the city, but where we do we prefer them not to use diesel but straight electric, and where they must use these old ones, in places where they operate actually within buildings, that the diesel be properly maintained in tip-top order. We cite them with violations if there is improper use of diesels.

THE CHAIRMAN: How far can you go?

MR. BLICKSMAN: Into the magistrate's court. We handle the locomotives on an individual locomotive





basis. The locomotive is cited by number.

The first time we have a record on it, we send a violation notice, calling for a reply from the owner as to what corrective action is instituted and what he intends to do in the future about it.

The second time we cite that same locomotive, it is a court summons.

The fines range for the first offence from \$25.00 to \$100.00. The second offence on the same piece of equipment, not by the same railroad, would be from \$50.00 to \$500.00. The fine usually runs to a minimum of \$25.00.

Occasionally, we will have one suspended where they convince the magistrate that there was something completely accidental, beyond their control, and no amount of foresight could have prevented it: then the magistrate may suspend sentence. There is still a finding of guilty, and a conviction, but no money penalty imposed.

MR. ELLIOTT: Do you not find you have pretty fair co-operation from them as a whole without taking them into court?

MR. BLICKSMAN: Oh, yes; they all do maintain their own smoke inspection. Long Island Railroad has now a group of six smoke watchmen.



MR. ELLIOTT: It is really as a last resort that you take them into court?

MR. BLICKSMAN: Really, they fight infractions before we do.

MR. ELLIOTT: They do everything they can to clean themselves?

MR. BLICKSMAN: Yes. As a matter of fact, with the Long Island Railroad, which is the outfit which operates most equipment within the city, they report to us every second months, on a bi-monthly basis.

The ships were a far bigger problem to us than locomotives. We have something like 520 miles of very busy water front.

Vessels come into the Port of New York from all corners of the world, in all stages of repair and disrepair, and when the Department originally went into operation, the heaviest contributor of smoke to the city was from these ships.

We within the Department soon realized that the regular city inspectors could not keep abreast of it, so we set up a special Marine Inspection Unit, men who devote their time exclusively to the water front, marine operations, and the men selected for that were men with a good many years marine experience;





they could speak their language; quite often they were engineering boys.

There were language barriers -- Portugese and Spanish and French and other languages, possibly, spoken on board a ship, particularly down in the fire room, and there was a good deal of educational work required to get the men who operated these vessels to realize that in the city of New York smoke was prohibited and if they did not comply, they would be hailed into court.

With the co-operation of the Corporation Counsel's office, we got over the hurdle, but how do we serve an infraction against a foreign corporation?

We were fortunate in that practically every major shipping company in the world has a New York representative of one sort or another -- a charter agent or an owner's agent, or somebody in the Port of New York on whom we could serve a summons, and who was responsible in some way for the operation of the vessel.

We also instituted the policy that on the first violation, a warning was given, plus reams of educational material, posters for display in their fire room, and where it was necessary we asked them to print their own interpretations for their crew -- where



they had foreign language speaking people.

If a vessel was again offending in the matter of smoke in a twelve-month period, they were cited, usually by service of some member of the corporate entity. If there was none, we served it on the captain of the vessel, and simultaneously a warrant officer was advised that he could not leave the harbour before the court case was returnable. We did get excellent co-operation.

We had many sessions with the Maritime Associations, listened to their problems, and made them aware of our problems, and got them to understand that we were not being unfair in our requests, that clean air benefited all concerned, because the stopping of smoke meant the saving of dollars through preventing waste of fuel.

THE CHAIRMAN: How long has this programme been in effect?

MR. BLICKSMAN: About five years.

THE CHAIRMAN: Do you find that over the past five years there has been a change-over of ocean-going ships from coal to diesel?

MR. BLICKSMAN: Well, it is extremely rare that we do find a coal-burning vessel, coming in the port of New York. They are nearly all diesel.



MR. HANAUER: Wait a minute. I do not think they are nearly all diesel. There are fuel oil burners which are not diesels.

THE CHAIRMAN: I mean, anything aside from coal.

We are getting ahead, as you know, with the St. Lawrence Seaway project, and some of us represent towns and cities along the route, and we are expecting that many ocean-going ships which heretofore stopped at Montreal will be coming right on through.

So this part of your operation is very interesting to the Committee. It gives us a basis on which to work when the Seaway becomes a reality.

MR. HANAUER: Of course, you have a problem that these ships will be sailing by, and then the apprehension of a violator becomes a matter of --

THE CHAIRMAN: I am talking only about those which come in and dock.

MR. ELLIOTT: We have a peculiar problem in my town. We have a hill about 500 feet high which represents to them back home a mountain. They call it a mountain. You go up that grade in less than half a mile and it is a heavy grade. There is





terrific traffic, four lanes of pretty heavy traffic. You get these slow-moving trucks loaded to the hilt, and you have to follow them most of the time, for you cannot go ahead or around them, and the odour is terrific. Do you have that problem here?

MR. BLICKSMAN: Not too much. We do have a small problem on our big bridges and highway bridges. You hold your nose while you are following a bus or a truck.

MR. ELLIOTT: We have steel foundries and other plants and foundries, but we do not get a quarter of the complaints that we get about diesel-burning buses and trucks going up the grades.

That is 75% of our problem in the city from which I come.

MR. BLICKSMAN: Well, if the bus or other vehicle is in good working order and receives proper maintenance, it should operate fairly nausea free. There may be some amount of visible fumes coming out when the engine is operating under such a heavy load, but a vehicle that discharges fumes to the extent that it blinds or suffocates you when you follow close behind it, is one that is in need of an overhaul or repair.

THE CHAIRMAN: Can you take them off the road?



MR. BLICKSMAN: No, that is something we have not done.

MR. ELLIOTT: I will tell you what they are talking about doing back home. They are talking about putting in tractor trolley equipment on these grades, and making the trucks and buses pay for being towed up the hill.

MR. BLICKSMAN: Could the route be re-designed?

MR. ELLIOTT: Oh, it would be very, very costly. It would cost about eight million dollars just to build one of these four-lane roads. It is right through solid rock.

MR. BELYEA: Have you any suggestions as to maintenance of diesels -- a mileage limit at which they should be overhauled and have some way of checking them to make sure they are kept in good working order at all times?

MR. ELLIOTT: I don't think they have the road problem we have.

HON. MR. KELLY: I think the railways have a mileage limit. I believe our railways have a limit of something like 20,000 miles for freight, 40,000 for passenger; something like that might be applied to diesel trucks.



MR. GORDON: As far as our problem is concerned, we are tackling it a segment at a time. We are fortunate in not having the hills that you have in some other areas.

We are, however, plagued with the same problem of smoke emission from diesel trucks, particularly the sand and gravel trucks. These are almost always lugging. Sometimes the emissions are due to the operators' laziness in not shifting to the proper gear going up a hill, so that the engine is not overloaded -- which, of course, is the prime cause of smoke.

MR. BELYEA: Would you explain that word "lugging" a little more?

MR. GORDON: "Lugging" is when the engine is operating at too low a speed with too heavy a load to get the maximum power out of it. In other words, it is trying to move the truck too fast for the gear it is in.

MR. BELYEA: They should be in a lower gear?

MR. GORDON: They are too lazy to shift the gear. There is nothing you can do to avoid that, except educating the drivers. They have to realize the importance of avoiding this kind of pollution. It can be done if the truck is properly





designed in the first instance, as most of them are.

MR. HANAUER: Other causes of smoky diesels are neglected maintenance.

If you have dirty ejectors or strainers, you are going to have smoke except in the most favourable operating conditions.

We all have experienced days where if you are driving behind a diesel truck, you note it is emitting a steady stream of pollution. I have seen it on slight grade approaches to bridges. They do not shift gears; they do it on the same gear, and the engine starts to leak and starts to smoke.

There are some diesel trucks which are improperly selected for the job, in order to keep their initial investment down; they may pick out the wrong gear box for a truck, without the proper rear axle ratio, perhaps, so they have trouble with the shift, but still you cannot get the proper gear ratio so that you will operate without smoke.

But as far as the trucks are concerned, we have not undertaken any actual supervision programme of their maintenance. We have, in a small way, undertaken such a supervision programme as far as buses are concerned.



When we feel that they are in pretty good shape and we have them pretty well trained, our next step will be the diesel trucks.

The only step we have taken on automobiles in general, is the rule on emission. If any automobile vehicle emits visible smoke or fumes while standing still or moving through a distance of more than 100 yards, it is a violation; and Mr. Blicksman can probably tell you a great deal better than I how effective that rule is; I know that a great many jurisdictions attempt to use the Ringelmann chart, which as regards automobile emission is entirely impracticable, because you are moving against a moving target and target background.

As far as I know, we are the first agency which has adopted a method which is really practical.

As far as this general problem is concerned, it is very largely a problem not only of educating the inspectors. Detroit has done a very good job on this. "Ben" Linsky, in co-operation with the Automobile Manufacturers Association, has met this problem head on, and I think they have come up with an excellent solution.

As a matter of fact, the American Manufacturers Association has produced a coloured sound film showing



the different kinds of emission on different kinds of automobile equipment.

DOCTOR EVIS (Secretary): We have seen that.

MR. HANAUER: And showing which are tolerable and which are a case of neglect or poor operation, or poor choice of equipment. We are going to have a showing of this film on the 31st of this month to all our engineers and inspectors. It was shown at a meeting of the Air Pollution Control Association.

I think, Mr. Flood, you might comment now on our ideas for the future for regulating the grade of fuel which can be used in diesels.

MR. FLOOD: Well, perhaps I had better cover the entire thing, if you don't mind. We are tackling this from various points of view.

First of all, as a matter of policy, we feel it is better to avoid the formation of the pollution at the source, rather than remove it before its discharge in the air. If you can avoid the formation, it is so much better than trying to remove it when it is formed. It is less complicated. In order to do that, our first step is, on the gasoline fuel basis, we have a rule requiring them to install





some kind of minimizing device on their buses. There are difficulties, but they have committed themselves to it.

MR. GORDON: Would that be a city ordinance?

MR. FLOOD: It is a rule of the department, which has the effect of a city ordinance.

We find on gasoline vehicles, that most of the objectionable emission takes place during the decelerating period, because of the high intake of the intake manifold. We find that these minimizing devices are very effective. They are not too expensive, and bus companies are going to install them.

We have also done some experimenting with a very cheap and elementary vacuum-limiting device. It is of the nature of a release valve, which can be installed for 75¢ or \$1.00 on a passenger automobile. Our experimentation has not been very extensive on that, but it is enough to demonstrate that it does cut down pollution.

But of course it is a different problem to try to control all of the automobiles in the city than it is to control the relatively few buses, which perhaps number 6,000 or thereabouts. We have



also considered limiting the grade of fuel which can be used in diesel engines to a fuel which has an end point of about 550. It would be, in effect, kerosene.

But we have found out in connection with this subject, first of all, that that fuel cannot be used on diesels, because 550 end point is essentially kerosene, has little lubricating value, and in some kinds of engines the ejectors will stall if a kerosene is used, because they depend on the lubricating value of oil for lubricating the ejectors.

Some of the bus companies which have the proper kind of engines specify what they call a 1 and  $1\frac{1}{2}$  diesel, which is a mixture having an end point of 625, or something of that sort.

We visited in the last few months, the Esso Research and Engineering Laboratory in Jersey. They have an extremely complete mechanical and chemical laboratory. They had done some experimenting on the effect of fuel on diesel engines as far as smoke emission is concerned.

They found that the effect of a change of fuel was relatively minor, and that most of the smoke emission in diesel engines was due to poor selection of equipment or neglected maintenance; so



as a result I reported to Commissioner Dr. Greenburg that perhaps we had better move rather slowly as far as specifying a minimum of diesel fuel is concerned.

We are, however, of the opinion that the use of propane or liquified petroleum gases will improve to a very large extent the emission characteristics of internal combustion engines.

We would like to see a control test made in New York city of the use of this fuel on buses instead of gasoline.

Chicago Transit Authority is doing that, and from the published reports we have seen, they are very happy in their choice of fuel, not only because of its better emission characteristics, but also because of its better economy, both in the cost of fuel and in the degree of necessary maintenance, when L.P.G. (liquid petroleum) is used.

We have recently been apprised of the development of the use of L.P.G. where it is used with an additive on diesel engines. By the use of simple devices, about 15% can be L.P.G. It is inspired into your intake, along with the diesel.

We are told that the effect is to increase the combustion characteristics of the diesel engine,





so that an exhaust is impractical to a very large extent.

Of course, the people who told us this were those whose business prosperity depends on L.P.G., so we have asked for substantiation in the form of laboratory tests of their claims. They claim that with this addition of L.P.G. as an additive they can improve the exhaust characteristics and also increase the power of the engine.

We are going to tackle an industry improvement programme on the heavy trucks in the city, and our method of tackling is first to get the principal operators in and point out the importance of right maintenance in eliminating air pollution for this source.

I probably have skipped a great many things, but perhaps somebody would like to ask some questions.

MR. HANAUER: I think you will find a lot of questions are coming from the table.

MR. FLOOD: I won't guarantee the answers.

MR. HANAUER: We are depending on you, Mr. Flood.

MR. MURDOCH: Do you have trouble with your stacks from the City Hall and public buildings and schools or State buildings and Federal buildings?



MR. FLOOD: Relatively little from city-owned buildings, but from the Transit Authority, yes, we do.

MR. MURDOCH: The municipal incinerators violate the law.

MR. HANAUER: But all of these agencies do have a programme, and we help them in obtaining approval for their projects with the City Fathers, the budget director, the holder of the purse strings, and we keep tab.

Mr. Flood does more directly than I. He gets the timetable set up so that we know just what is to be done, how soon it will be done, how soon the funds will be available, and how soon, after the funds have been made available, the work is expected to be completed.

MR. GORDON: Sometimes you find a shortage of manpower in enforcing the regulations?

MR. FLOOD: I can answer, that he does find the shortage of manpower rather an important handicap, a serious handicap. I, to a more limited extent, find that to be the case.

MR. HANAUER: On this question of manpower, we have been trying to get the Mayor and his budget to "go along" with us, and, seeing we are a



relatively new agency in the city, and one of the small ones, we have done fairly well since 1952. If I recollect correctly, our budget in 1952 was something around \$60,000.

Our budget today, as I have mentioned, is something over \$600,000, and we have made a request for this fiscal period of approximately \$850,000. We have~~not~~ got it, but we will continue to renew our request for what we think is an adequate budget for a department of this kind in a city of this size.

I think that 10¢ per capita for air pollution control is a ridiculously small sum for the citizens of the city to pay. However, if we get \$800,000 in the next fiscal period, we should build our staff and our equipment up to use it, and then maybe in a year or two years after that, we can go after another \$200,000, until we get ourselves up somewhere between 12¢ and 15¢ per capita.

Our present view is that this is probably where we will stabilize, but of course we do not know what the future holds, and we are very unhappy now because Mr. Blicksman and his Bureau, with 40 men, has about ten of them office-bound, 4 or 5 of them are in the courts, and possibly at schools and on vacation, which means that we have about 30 men in the field;





and that staff, for an area of about 600 square miles, is not very large.

MR. ELLIOTT: Are they on a 40-hour week?

MR. HANAUER: 35.

MR. BELYEA: Can you analyze for us the qualifications of the men? For example, how many engineers do you have?

MR. BLICKSMAN: We have provision for 15 engineers and 4 junior engineers, of which only one appointment is firm and permanently filled. We cannot get the men at the starting salaries. The starting salary for a junior engineer is \$4,550, and we cannot get men who are qualified to take the job, so we have to get men who are not qualified by examination.

Then we have eight assistant engineers, and we have two full engineers; one senior engineer, myself.

There are two grades above this in the city engineering service -- principal and chief engineer.

I have the official title of Chief Engineer, but not the civil service title.

In the engineering service, the lowest rate is \$4,550. and the highest rate \$13,200. We are not at all happy about the supply of engineers available;



we just cannot get the proper men.

MR. ELLIOTT: How many men would you have on plant examining?

MR. BLICKSMAN: There are three man on it all the time. There are peak periods when we ship men from other functions to help these three examiners. On inspections, we have four men normally, but there again we have peak periods, and in peak periods we shift our staff.

MR. ELLIOTT: Inspecting installations and improving installations would probably take more than three men, would it not?

MR. BLICKSMAN: No.

MR. ELLIOTT: The same three men do the whole thing?

MR. BLICKSMAN: The same three men do the whole thing.

MR. ELLIOTT: That is, the inspecting and the approving?

MR. BLICKSMAN: No. We have ~~three~~ three men who are full time on examining.

MR. ELLIOTT: In the office?

MR. BLICKSMAN: In the office. Then we have four men full time in the field. There are peak periods both in examining and in inspecting. Luckily



they do not coincide, so if we have a slack period of inspecting and a peak period of examining, we may take one or two men in the field and put them on examining; but usually the men we are assigning to other functions are the ones we put to help out in examining and inspecting.

The Engineering Bureau, as well as examining and inspecting, takes care of the industry improvement programme -- one segment of the activity -- such as small foundries and refineries, and follow a procedure to get them to improve their equipment so that they will not be offending by polluting the air.

We have done something on buses; and a heavy truck programme will be tackled if the staff is made available for the work.

MR. ELLIOTT: Do you charge a fee for examining plans to the people who present them?

MR. BLICKSMAN: They do have to pay a fee, and it is governed by the size.

MR. ELLIOTT: The dollars and cents cost of the project?

MR. BLICKSMAN: Well, indirectly, but it is based on the boiler size, and the amount of oil burned or the amount of air handled in air purification.





THE CHAIRMAN: Would the amount received be over and above your regular budget, or included in your regular budget?

MR. BLICKSMAN: It all goes into the general funds of the city. It is not a question of supplementing the budget; it goes into the end account.

THE CHAIRMAN: How much do you figure was put in from your department into general funds of the city?

MR. BLICKSMAN: Last year, we put in over \$100,000.

MR. MORNINGSTAR: Then it is not costing the ratepayers as much as they think it is.

MR. GORDON: Are the foundries much of a problem here?

MR. BLICKSMAN: They are, when they are located in the wrong area, if they are located in industrial areas.

I recall one occasion when the fire department was called out in the middle of the night on three different occasions because the smoke coming out was so dense. The place must have looked as though it was on fire, and the neighbours called the fire department to put out what they thought was a fire.



We did not catch these people red-handed, because it was in the middle of the night and we were not notified until later.

MR. ELLIOTT: Do you have really bad garbage dump fires from time to time?

MR. BLICKSMAN: We do.

MR. ELLIOTT: And do you feel that you have them under control?

MR. BLICKSMAN: Our last bad dump fire occurred in 1955. We have not had one since. It required about a week of the joint efforts of the Department of Sanitation and the fire department to extinguish the fire.

MR. FLOOD: The city of New York provides free collection service, and we have possibly twelve municipal incinerators located in various points around the city. There is a local law which requires all apartment houses over three stories high, having more than twelve families, to have their own incinerator. The purpose of that law was to reduce the amount of refuse handled by the Department of Sanitation in their free service.

Most of this refuse which is collected is not separated into combustible and incombustible. It is all taken in together.



MR. ELLIOTT: In other words, they put out three garbage cans.

MR. FLOOD: That is right, and they are collected by sanitation trucks. The minimum collection is three times a week. It is taken either directly to the incinerator or to what is called a waterfront dump.

At the waterfront dump, it is dumped on a scow, and a train of scows is taken to Staten Island where it is unloaded and hauled to a land reclamation project, where it is dumped and covered by means of bulldozers and heavy tractors.

The amount of available land that they can use for that purpose is running out, so for that purpose they have this law requiring the apartment house incinerators to be put into effect, and this land fill is reserved for incombustible -- that is the stuff that has passed through the incinerator, the residue, and also some local collections from down in the area -- located in Staten Island.

The incinerator programme is not yet complete. They are building and re-building and replacing incinerators constantly.

MR. ELLIOTT: I am talking of the small town. You are a big city here. In fact, your city's





population is actually bigger than that of our whole province as far as that goes.

We regulate the garbage collection dumps according to the temperature of the air. If it is a hot day, a certain class of garbage is all burned. The cooler the day, the more we dump and the more we use for fill.

We save about 30¢ a ton by taking it to the dump and using it as a fill rather than burning it. We are trying to save money by using the dumps. You do not allow that sort of garbage to go to the dumps at all.

We have a terrific problem all the time, in that all the paper and scrapped meats, and everything is going to our dump, and it would make a terrifically smelly fire, if it ever got going.

But we find we can dump that garbage and it only costs 60¢ a ton, as against 90¢ to burn it. But you do not attempt to burn that class of garbage?

MR. BLICKSMAN: All kitchen waste, so-called, is burned. None of it is permitted to be dumped.

MR. ELLIOTT: Then you have a different problem from ours.

MR. FLOOD: In this connection, I may mention the apartment house incinerators.



MR. HANAUER: We have mentioned those.

MR. FLOOD: If you have an opportunity to stop flue feed incinerators in your area, do so.

THE CHAIRMAN: Your budget is \$605,000. What income do you derive from any sources to assist in that budget? Or is there an income?

MR. HANAUER: Oh yes, there is an income, but this is income to the city's general fund. The Department may collect certain money, but it is not applied to the Department. All the money collected for permits and what have you, as I understand our procedures, goes to the general fund of the city, and is part of whatever revenues it gets from any other source.

As a matter of interest, the total fees we collect for plans and examinations, and what have you, was how much less year?

MR. FLOOD: As I recall, \$112,000.

MR. HANAUER: A hundred-odd thousand dollars. The monies that are received in the magistrate's court by way of fines do not go to us either. They also go to the general fund, through the court. What was the total last year, Mr. Blicksman?

MR. BLICKSMAN: About \$14,000.'



MR. ELLIOTT: It would cost the courts that to operate.

MR. HANAUER: It would cost them more.

THE CHAIRMAN: So that roughly you can say that your indirect revenue is about \$100,000, compared to a budget of \$600,000.

MR. HANAUER: Of course, keep in mind that we do not examine plans for the installation of heating plants in single family houses, and we do not examine in detail. We merely get the registration card, and there is a small fee of \$3.00 or \$3.50 for installations which have a heat input of 350,000 b.t.u.'s an hour or less. This takes a large number of smaller installations out of our field of examination.

So what we are really concerned with are the larger plants.

MR. ELLIOTT: These new apartments or buildings we saw out here yesterday, in the Harlem area; are they operated or controlled by the city or the insurance companies?

MR. HANAUER: It depends which ones at which you were looking. There are both kinds.

MR. ELLIOTT: Those in Harlem, would they be operated by the city?





MR. BLICKSMAN: Some city, some state, some co-operative, some insurance companies. There are all types.

MR. ELLIOTT: What are they using for incinerators?

MR. BLICKSMAN: Fuel feed incinerators. This is the building code; we have no control of them.

MR. ELLIOTT: They are still putting them in?

MR. BLICKSMAN: They have to.

MR. ELLIOTT: You have not had the power to get them around to proper garbage collection?

MR. HANAUER: A number of years ago, in either a press or a radio interview, Dr. Greenburg voiced the hope, or opinion, or request, that all fuel fed incinerators be outlawed immediately; and the next morning he had a delegation here from the Department of Sanitation, and its budget member said that if that were done it would cost the city of New York in the first year, \$12,000,000, and thereafter five or six millions.

MR. ELLIOTT: I suppose it would.

MR. HANAUER: Everybody forgot what it is costing the city in dirt and fumes to let it continue. This point you raised earlier in our



discussion.

THE CHAIRMAN: Do you think it is so serious that incinerators should be eliminated from apartment buildings?

MR. HANAUER: I certainly do. Either that or let someone come along and build a better mouse trap.

These are the qualifications for our staff as filed with the Department of Personnel and the Civil Service Commission. You are welcome to them.

THE CHAIRMAN: What about odours? Do you treat that problem the same as the dirt?

MR. BLICKSMAN: Yes. We have a section in our rules and regulations prohibiting odours on the basis that they create a nuisance, rather than attempting to set a standard of the valuation.

There is nothing satisfactory for evaluating ordours, or the degree of concentration, so our rule is on the basis of whether it creates a nuisance or not, and the Commissioner can deem and declare an odour to be a nuisance.

THE CHAIRMAN: Do you have large packing houses and slaughter houses in the city?

MR. BLICKSMAN: We do, and believe it or not,



they have been brought under control. If you have occasion to travel up the west side drive of Manhattan, you will pass a heavy concentration of packing houses, odour-free, and there are live cattle being slaughtered and dressed therein.

DOCTOR EVIS (Secretary): Can you tell us the type of control?

MR. BLICKSMAN: With packing houses, most of the odour control is good housekeeping, proper maintenance and so forth. Odour counteractants are used. We only frown on the use of a counteractant where it is being applied to smoke of a toxic or irritant or hazardous nature. We do not want that type of odour or substance missed or concealed.

MR. HANAUER: This is a real danger. If an industrial plant has a gas or an odour that is likely to be toxic in some concentration, and you permit masking, you have destroyed the very signal you want to get; and the regulation covering the masking of odours is something we are considering, but have not come to any conclusion.

DOCTOR EVIS (Secretary): But I imagine it would be all right, for example, for an ordinary packing house odour. There is not, I imagine, a real hazard from that.





MR. BLICKSMAN: They find the use of an ammonia compound will not only prevent a decomposition which results in odour, but actually has a slight odour counteractant quality as well; so while they are doing good in those areas, they hide, by masking, any resultant offensive odours.

THE CHAIRMAN: What kind of co-operation do you get from State and Federal buildings within New York city in respect of air pollution?

MR. BLICKSMAN: As a rule, excellent. When we observed from our office, smoke from one of the Federally-operated buildings, it only took two or three communications with the general service administration to have a complete plant check-over.

THE CHAIRMAN: In installing the new ordinance, Mr. Hanauer, what is the practical period of time to give a large industry, for example, a firm employing 1,000 people, if their equipment to prevent air pollution and smoke is inadequate?

They must change over according to the requirements of your ordinance. What is a reasonable period of time to give them to make the change?

MR. HANAUER: I think you have to judge the reasonableness of any period by the complexity



of the organization involved.

As I mentioned to you yesterday, Consolidated Edison is spending some \$15 million, and it is taking them a six or seven-year period. It is almost impossible for them to do it any sooner, because the equipment is large, it takes a long time to design and build, and even a longer time to install, because they must do it without shutting down their generating plant.

However, the installation of the new oil burner injector gun, or a steam nozzle or circulating veins, or excess air blowers is a relatively simple installation, and it may be that 90 days would be adequate for such an installation.

I don't know I can give you a pat answer on that. I think you have to consider how long it takes to design equipment, to get it there, and install it. I know that no municipality wants to put a hardship on its industrial citizens. On the other hand, you don't want to wait forever.

THE CHAIRMAN: So you feel you have the citizens generally aware of the seriousness of the air pollution problem in New York city, and they are prepared to back your department 100 percent?



MR. HANAUER: We can only judge by the letters we get here. I do not know what a national reaction would be, but for every one hundred complaining letters, we get less than one commending one. But this is fairly normal, and the fact that we get a few every week gives us cause for rejoicing, and I would say that we have the citizens behind us.

I get personal calls of this kind, "It took you a long time to get around to this, but thank goodness you have corrected such and such a complaint".

MR. ELLIOTT: In your budget, have you any appropriation for educating the public by telling them what is going on?

MR. HANAUER: In a very small way, and indirectly. The Secretary of the Department, who also has the duty of being the public relations man, has the responsibility of advising the public and the citizens through any means that is practical as to what we are doing and why we are doing it, and what we need from people to get their co-operation.

We have some very small fund, less than \$1,000, for purchasing and distributing material;





with the result that, when we have a large distribution to make, such as our fuel oil guide and burner maintenance guide, we have to get the co-operation of the Petroleum Institute. They provided some 250,000 leaflets free of charge. We supplied the copy and they arranged for the distribution.

THE CHAIRMAN: Do radio and T.V. co-operate in news releases, and so on?

MR. HANAUER: Yes. As a matter of fact, I was on the radio last night, and I shall be on WPIX television programme tomorrow evening.

THE CHAIRMAN: That is free, is it not?

MR. HANAUER: We do not pay for these things. I think it would be a mistake for a city agency to buy its publicity. Either what we have to say is important to the citizens, or we had better keep quiet. If your radio and papers and television think that we have something important to say, they will help us say it.

THE CHAIRMAN: In other words, they think it is worthwhile giving time in order to convince the public?

MR. HANAUER: Yes, that is right. These people have to give public service in order to



maintain their licenses.

Gentlemen, I hate to have to leave you for a short time, but I have to assist the Mayor in connection with these citations.

I will catch up with you at luncheon at the Engineers' Club, where you will be the guests of Mr. Frederick Mallette.

THE CHAIRMAN: Thank you very much.

MR. HANAUER: You gentlemen stay here. You are expected up there at twelve-thirty p.m. Mr. Flood and Mr. Blicksman, I am sure, will take care of you.

MR. BLICKSMAN: On your question of warnings on the part of the public on air pollution, there is a vast segment of the population in the city of New York which is not, I believe, aware of the existence of this department.

I base my opinion on the fact that every time we have some press release or appearance by a member of the staff on television or radio, there is an increase in the number of complaints received the following day.

Many of these are about conditions of which we had no prior record, or from persons who had never complained before; and many of them in their



letters will state that they are glad to know that there is a department of air pollution control; they never knew that until then.

Of the eight or eight and one-half millions in the city of New York, there are some -- just how many I do not know -- who still have not learned of the existence of this department.

THE CHAIRMAN: Of course, there are some who do not even know it is Sunday, in every large city.

MR. BELYEA: You had a barrel burner in Brooklyn which was given to you people. Is it under control?

MR. BLICKSMAN: Surprisingly; on paper it seemed as though it was inadequate. They were given a contingency work permit to go ahead with the installation, and when we examined it, we were very pleasantly surprised to see it does do a thoroughly good job.

MR. BELYEA: When was it re-designed?

MR. BLICKSMAN: Last year.

MR. BELYEA: Are they using a secondary combustion chamber?

MR. BLICKSMAN: No. What this in effect is, it is just an open-ended container with four



burners, burning No. 2 oil.

MR. BELYEA: The torches go in either way?

MR. BLICKSMAN: The torches go in vertically, up and down. The base of the container is a water pit, so what, in effect, it is doing, rather than burning off all combustibles, when it comes in contact with the first heat, it is burned out, and most of it goes in the pit and is skimmed off and washed away. It does not attempt to burn all the material originally in the barrel.

The high temperature produced by the oil burners burns off any smoke from any smoke-producing materials which may be in the barrels. You secure almost complete combustion before the gases get out. The barrel takes from the time of the conveyor belt, eight minutes before it emerges at the far end.

MR. BELYEA: How long would the tunnel be?

MR. BLICKSMAN: About 20 feet long. It is very simple, not expensive, and it is a saving in manpower, and has curtailed a long series of summonses which were issued for prior violations. We originally had a more complicated barrel-burning





incinerator.

MR. BELYEA: Is there an automatic conveyor on that?

MR. BLICKSMAN: Yes.

MR. BELYEA: We have a couple of these. There is one up in Mr. Cowling's district which is causing a lot of trouble.

MR. BLICKSMAN: Before this installation we had to turn away a great many barrels. Barrels for example which contained printer's ink or automobile undercoating or tarry substances of one sort or another. Now he takes everything. I watched the demonstration. He had some barrels still in his yard which had not been processed, he said, for twenty years or so, because they were so smoke producing, materials including plastics and automobile undercoating, heavy layers left behind in the drum, and he felt very satisfied now because he does not attempt to burn off everything inside of the barrel.

MR. BELYEA: What is the name of the company?

MR. BLICKSMAN: The Myer Handler Company. They are located on Franklin Street, Brooklyn, down in this part of Brooklyn.



MR. ELLIOTT: I want to ask a very peculiar question, and do not think I am trying to "put you on the spot". Do you think it is possible to handle all garbage by dumping and do a satisfactory job, where you would not have trouble with fires or odours or anything?

MR. BLICKSMAN: You would have trouble with fires and odours.

MR. ELLIOTT: Even when there is pre-packing?

MR. BLICKSMAN: With excellent compacting and proper covering with 18 or 24-inch layers of earth, you are still going to have heat. It is impossible to eliminate it.

MR. ELLIOTT: You have still got to incinerate some garbage?

MR. BLICKSMAN: I say you would incinerate all your garbage.

MR. ELLIOTT: Supposing the temperature is zero, do you not think you can properly compact it at that time?

MR. BLICKSMAN: You will have no odours at that time.

MR. ELLIOTT: Do you think you will have combustion in the spring or some time later?



MR. BLICKSMAN: Yes, because garbage is still garbage and it decomposes, and as it decomposes, it generates heat. Odours will come up even with an 18 or 24-inch covering; and it will reach that ripe warm state where it starts to burn.

MR. ELLIOTT: We are doing it, and have been doing it for years.

MR. BLICKSMAN: We had one in the Bronx, right near the northern boundary of the city of New York, and five years after the operation had ceased, and there was no longer a dump, it was covered-over ground, it caught fire.

In fact, one of our inspectors investigating odours, before the thing really burst into flames in the open, walked across it and sunk up to his knees, and was pretty well burned around the ankles.

MR. ELLIOTT: Was that a sanitation dump?

MR. BLICKSMAN: No, it was a properly filled dump.

MR. ELLIOTT: I cannot say that we have had that, but we have had plaques of grasshoppers, crickets, and so on, from these old dumps.

MR. BLICKSMAN: If you wait long enough, that garbage will take fire.





MR. ELLIOTT: Even up to five years?

MR. FLOOD: Even after that. I do not recall where it was, but somebody mentioned some test borings into old dump sites as to the condition or state of decomposition of material that had been buried three, four and five years, and, surprisingly, that material which was two years old was virtually almost as fresh as on the day it was buried, but going into the third year decomposition, was progressing very rapidly.

MR. ELLIOTT: When material is dumped into, say, slough or marsh land that is covered with water, what would happen then?

MR. BRICKSMAN: Well, dumping on top<sup>of</sup> it is going to send the water away. Eventually, it may dehydrate. Of course, I cannot tell you for sure that this would happen, but I foresee you would have trouble some time in the future.

THE CHAIRMAN: I wonder if you can just tell us what, in your opinion, are the main contributors? Mr. Hanauer told us yesterday what were the main contributors to your air pollution in New York. Maybe you, as Chief of the inspection staff, would like to tell us what you think are the main contributors to the problem.



MR. FLOOD: One big headache is the fuel feed incinerator in apartment houses, as far as the complaint load is concerned.

THE CHAIRMAN: The people in the apartments themselves are complaining, are they?

MR. FLOOD: They are not complaining about the incinerator in their own building. They complain about the incinerator next door, because of the smoke and fumes which enter their windows from the chimney.

THE CHAIRMAN: Do you have any back-yard incinerators?

MR. FLOOD: No. They are not permitted.

THE CHAIRMAN: The main contributor would be the incinerator from multiple dwelling areas in New York city?

MR. FLOOD: Yes.

MR. ELLIOTT: Would you say that 75 percent. of your population is in apartments? It must be very close to that. A very large percentage of your population is in apartments?

MR. FLOOD: Most of our population are "cliff dwellers".

MR. ELLIOTT: So you are in a different position from any city on the continent?



MR. FLOOD: We do have large areas of the city exclusively one or two family houses, but they are in the outskirts. However, many areas in the city are not as yet built up at all.

MR. ELLIOTT: There is vacant land in some areas?

MR. FLOOD: There is vacant land.

MR. ELLIOTT: Is there much vacant land?

MR. FLOOD: Not too much.

MR. ELLIOTT: You have not too many single family dwellings?

MR. FLOOD: Actually, I do not know.

MR. BLICKSMAN: You can arrive at a fairly accurate estimate. There are 10,000 apartment house incinerators, and the average apartment house has about 100 apartments, with a probable average size of four rooms, and an average population of about one per room.

MR. BELYEA: Do you include tenements?

MR. BLICKSMAN: There are a good many tenements that were built prior to the law requiring the incinerators in apartment houses, so we estimate probably 10,000 so-called new-law apartment houses, and I do not know how many of the old-law. It has been estimated that anywhere up to 125,000 people



are in the old-law tenements, as they call them. I would estimate in modern apartment houses, with incinerators, there are probably four million people.

MR. BELYEA: In apartments?

MR. BLICKSMAN: In apartments.

MR. BELYEA: These tenements do not have incinerators?

MR. BLICKSMAN: No, they do not even have central heating at the present time. Just hot water. That is about the only service supplied.

MR. FLOOD: New York city has four burroughs and we only have jurisdiction within them, but we are responsible to nobody else, as I understand it.

MR. BELYEA: They have certain local governments?

MR. BLICKSMAN: Yes. Nassau County has its own municipality, with its own city departments, health departments, and so on.

MR. ELLIOTT: Do you have any problem with them?

MR. GORDON: Do they shoot their dirt over to you?

MR. FLOOD: The wind is usually in the opposite direction.





MR. GORDON: The prevailing wind helps you?

MR. FLOOD: Helps as far as Nassau is concerned. Hurts us as far as Jersey is concerned. We get, we believe, a great deal of pollution from Jersey. The hottest industrial area in the entire State is in the half-dozen counties over to the west.

DOCTOR EVIS (Secretary): It is like England -- Manchester and London -- with a big concentration of industry in a small area.

MR. FLOOD: The Mayor has instituted a regional plan to take care of this problem, and recently the States of New York and New Jersey have appropriated \$30,000 for the investigation, and they have had Federal authorization for the inter-state Sanitation Commission to act as far as air pollution as well as water pollution is concerned.

We are just at the starting point to try and control the pollution from Jersey. Jersey City recently enacted a law on air pollution. Dump fires are prohibited throughout Jersey now, but it is up to the local agency to enforce that prohibition.

DOCTOR EVIS (Secretary): Did Connecticut put \$30,000 in, too?



MR. FLOOD: No, because Connecticut is not too much concerned with air pollution problems. It is interested in water sanitation.

DOCTOR EVIS (Secretary): But Connecticut is in the inter-state group?

MR. FLOOD: Connecticut is in the inter-state sanitation commission.

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---Here inserted the following proceedings, held later in the morning.

MR. BLICKSMAN: As regards smoke, our number two problem is our apartment house No. 6 oil-fired boilers, and the smoke nuisance coming from that. Then beyond that, we go into so many types of problems that I would not attempt to say which is more urgent.

THE CHAIRMAN: Would you put the automobile up there?

MR. ELLIOTT: Would the diesel be there at all?

MR. BLICKSMAN: Not in the top two categories, It would not.

MR. HANAUER: Mr. Blicksman has indicated that his heaviest complaints concern apartment incinerators, because it is <sup>a</sup> particularly annoying



situation in the local area round the incinerator.

But if you are considering over-all air impurity produced by these various sources, as far as I am concerned, I do not think the incinerator is at the top. Probably it is the incomplete burning of oil and production of smoke. That is where the massive amount of air pollution comes from, and the sulphur dioxide.

The incinerator is particularly annoying as a local nuisance, but as an over-all contributor to pollution, I do not think it is as important.

MR. ELLIOTT: You mean the apartment incinerators?

MR. HANAUER: The apartment incinerators, that is right. That is the local nuisance.

THE CHAIRMAN: What was the other one?

MR. HANAUER: Oil.

MR. ELLIOTT: From what?

MR. HANAUER: From fuel-burning equipment, and also private homes, and No. 6.

MR. ELLIOTT: In other words, you reverse it, he says the incinerator, and you say No. 6?

MR. HANAUER: Bearing in mind he is judging from the complaints he gets.

MR. BLICKSMAN: The complaints come to me, and it is up to us in the Bureau of Inspection to





act on these complaints, and what the citizens are aroused about are incinerators.

What actually is responsible for more pollution in the city is another question again. I think there is more over-all pollution from the oil that is being burned rather than the garbage which is being burned.

THE CHAIRMAN: You found it necessary to require collectors on some of these oil burners?

MR. BLICKSMAN: Not collectors. We have found it necessary to make major changes in the equipment, sometimes to the extent of having a fan bringing air in the boiler room, where it was remote from the outside; correction of the combustion chamber, the oil temperature, the oil heater, and so forth. The major factor in the production of smoke is lack of draught of some kind or another, either an improperly constructed chimney or one that has deteriorated.

There again, there are a great many nuisance complaints because of the construction of a relatively low building beside a high one, so that when people get smoke into their living quarters from an apartment, or theatre, or store, they do not care whether it is a violation as far as our



rules are concerned or not; it is damaging to them and they have a right to protection or redress.

Only this morning, we had a small job where a theatre is in behind two high buildings, and that theatre is heated by an oil-fired boiler, and the stack is located at such a place that an emission comes in the apartments. It may not be a smoke violation when we see it, but it has nuisance value. It may not contribute to the overall pollution, but it is a local complaint, and they have a right to protection.

MR. ELLIOTT: The peculiar construction of your city would give you plenty of that?

MR. BLICKSMAN: Oh, yes.

MR. MORNINGSTAR: Has the State of New Jersey gone ahead of New York with air pollution and smoke control?

MR. BLICKSMAN: Just recently, they enacted an ordinance prohibiting open fires on dumps, but every one of the dumps in the State of New Jersey is still maintaining open fires.

MR. MORNINGSTAR: It is just a new ordinance; it has not been enforced as yet?

MR. BLICKSMAN: In New York, we prohibited open fires on dumps back in April of 1954, As a



matter of fact, an accidental fire, or a so-called accidental fire, if there is a fire there and they do not use fire extinguishing equipment -- that is, they are not actually using<sup>it</sup>/at the time you are inspecting it, they get a summons.

---The following proceeding continued from where interrupted (See page 2487).

MR. ELLIOTT: Have you still a water pollution problem too?

MR. BLICKSMAN: As far as New York, and, I think, as far as New Jersey, is concerned, sewage treatment is mostly in operation, and eventually all of it will be treated.

MR. ELLIOTT: Do you have much problem there with coal piles and dust?

MR. HANAUER: We have had a great deal, and I think Mr. Blicksman can tell us about the trouble they had with dust until they switched to oil.

MR. BLICKSMAN: There is not too much coal stock-piled except at the large utility plants, and though they do stock-pile, they are pretty well under control. I do not think we have had any complaints on that in the last year or year and



a half.

We have their co-operation -- proper techniques of compacting and wetting down.

MR. HANAUER: The big stock-piling is done as it is brought in, in order to cover themselves in case of an emergency such as a strike. They do have a stock pile over in Astoria. This is very carefully tended and covered with asphalt and cement so they are pretty well insulated from air, and any dust emission is prevented.

There is a certain local dust problem up in this area here, but it is not very densely populated, and they have it pretty well under control. They realize the difficulty.

MR. GORDON: You do have a method of dealing with them?

MR. HANAUER: Yes.

MR. GORDON: Do you have terrifically large sand piles for piling sand?

MR. HANAUER: Not to avoid your question, but we have an asphalt plant which is in a similar situation, where they have a lot of sand, and for most of these we require control equipment, and if they do emit sand or dust, or course they are subject to punitive action, the same as smoke





emission.

MR. BLICKSMAN: All our coal comes in by barge, and the utilities use the coal direct from the barge every day, so storage of coal is purely for a reserve, if there is a strike on the shipping end.

MR. THOMAS (Oshawa): Do they pull in by tugs?

MR. BLICKSMAN: They are pulled in by tugs, so there is not too much handling of this coal. Similarly the sand is brought in by barge, unloaded directly into the plant for its daily current needs. There is very little stock-piling. Where it is stock-piled, it is loaded direct from barges into hoppers and buckets, and so forth.

---The reference to oil-fired boilers in apartment houses, already recorded, followed. (See pages 2487 to 2491 inclusive).

---Whereupon the further proceedings of this Committee adjourned, to reconvene at the Engineers' Club at 12:30 o'clock, p.m.

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P R O C E E D I N G S

of a

LUNCHEON TENDERED TO THE SELECT COMMITTEE ON SMOKE  
CONTROL AND AIR POLLUTION, HELD AT THE ENGINEERS'  
CLUB, NEW YORK CITY, N.Y., TUESDAY, OCTOBER 23, 1956,  
AT 12:30 O'CLOCK, P.M.

Mr. Frederick Mallette, Toastmaster,  
Presiding.

- - - - -

PRESENT:

Mr. A. H. Cowling, Chairman of Committee.

Hon. Mr. Kelly,

Messrs. Morningstar,

Elliott,

Murdoch,

Gordon,

Thomas (Oshawa)

Dr. F. A. Evis, Secretary.

APPEARANCES:

Mr. Seth G. Hess,                      Director and Chief Engineer  
Inter-State Sanitation  
Commission.

Mr. Harvey L. Titus,                  Carbon Black industry.



Mr. Harold Blicksman,	Director, Bureau of Inspection.
Mr. Leo. Flood,	Division of Engineer- ing.
Mr. H. A. Belyea,	Air Pollution Control Officer, Metropolitan Toronto.
Mr. S. J. Hanauer,	Deputy Commissioner, Department of Air Pollution Control, New York City.
Dr. M. B. Jacobs,	Director, Department of Air Pollution Control Laboratory, New York City.
Mr. K. Kowald,	Secretary, Department of Air Pollution Control, New York City.

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THE CHAIRMAN: What do you do in New York about incombustible incinerated garbage? Where do you put it?

MR. HANAUER: This depends on whose garbage you are talking about.

THE CHAIRMAN: Yours, for instance.

MR. HANAUER: Me, personally? I throw mine down a little chute in my apartment house, knowing full well when it gets down, it is going to smoulder, and stink and smell up the neighbourhood. But that is the way it is.

There are some 10,000 fuel-fed incinerators





in the city of New York.

The remains of the incineration process are put out in cans on the sidewalk at stated intervals, and the Department of Sanitation carts them away.

THE CHAIRMAN: Where?

MR. HANAUER: If it is completely incombustible and the area has a sort of a segregation programme, they will either dump it in a scow and take it out to sea and dump it, in the hope that it does not float in, or they will use it for land fill.

The stuff which they take out of their own incinerators, the refuse from that, is generally used for land fill, but this is a subject I cannot give you much detail on, because Sanitation runs its own division.

MR. HESS: I hope you are wrong, because the Inter-State Sanitation Commission has a dual purpose, and that is to prevent the pollution of water in this area, which is our primary purpose, and just recently we have been given the job of a study of air pollution to find out whether it is an Inter-State problem, and if it is so, to make recommendations on it.



I hope that there is no garbage in any sense being carted to sea today. The garbage that goes up on the scows, which you see borne on the scows at various times, is being, or should be, transported to land fills.

MR. HANAUER: I would not attempt to contradict you,,because I do not know.

MR. HESS: If you are right, we have to get busy, but I do not<sup>think</sup>/there is any of the garbage going to sea.

THE CHAIRMAN: Does that include things that do not burn in the first stage, and secondly, the residue from the bottom of incinerators where they have burned things?

MR. HESS: To the best of my knowledge, the things which are not burned are also put on to the land fills. There are two sources of land fills we are operating in New York City now. One is a land fill of unburned garbage; and they are using these land fills now, the controlled land-fills, to put on a layer of garbage, and then a layer of earth.

MR. HANAUER: If you gentlemen are seriously interested in this land fill and sanitation department operations, I think you ought to stay and have a forenoon with Sanitation on it, because this is going



to "come out of the horse's mouth".

We, on the side-lines, know what sanitation is doing; but what it has in mind doing, I do not know, and I don't know whether you know.

MR. HESS: Well, my knowledge of it, of course, is only from the control point of view, and I may be hoodwinked, but I do think it would be splendid to set up a meeting with Sanitation for this purpose.

DOCTOR EVIS (Secretary): I think that these members are asking these questions about garbage disposal more particularly with regard to their own constituencies, rather than concerning air pollution which is the Committee's job.

MR. MACAULAY, Q.C.: I think, Doctor, that may be right from some of my colleague's points of view, and, for instance, my own, in Toronto, where they are planning on setting up seven, eight, nine or ten metropolitan open dumps, which you remember we discussed. It can be a very serious problem. I, myself, feel it must be considered in our report in some way or other.

DOCTOR EVIS (Secretary): I think you are quite right. These dumps should be stopped before they are started. Dumps have been spotted all



over Metropolitan Toronto, so regardless of which way the wind blows, you are going to get it from one quarter of the city.

MR. ELLIOTT: I do not know whether that would apply to Hamilton. What suits you in Toronto, may not suit us in Hamilton.

MR. HESS: I think you will have some opportunity of speaking to the New Jersey people about the open dump and what has been the situation along the Jersey meadows. I think you will find they have come face to face with that problem.

MR. ELLIOTT: We have some of the nicest buildings on the North American continent on land developed from garbage dump material, and that stuff included what they took from the incinerators.

MR. MACAULAY:Q.C.: I think there are some findings which we can make available, or in any event, show what has been done in other places.

It is at least useful to make the experience of New York available to other communities . . .

THE TOASTMASTER: On behalf of the Committee on Air Pollution Control, I want to welcome you here and to tell you a little about what we are doing in our Committee.

Doctor Evis and I have had some previous





correspondence, and if we can be of any service to you, we certainly want to be.

You are profiting, perhaps, by some of our mistakes, since you are making a new start. When I am through, Mr. Hess will tell you something about the Inter-State pollution study which is now underway in this area. I am particularly happy to welcome you, because I feel half Canadian. My mother was born in Toronto, so you probably approve of me on that score anyway.

The American Society of Mechanical Engineers has been interested in air pollution; and I say that in the narrow sense, as a Society whose, perhaps, most active and powerful members are in the power industry, it has had a great deal of interest in the combustion process.

As a result, in the early forties -- of course, before that, there was other~~y~~ activity, but the first formal activity began in the early forties -- a group began to develop a model ordinance.

Incidentally, I have some copies of that document over here. I have some other literature here which you may feel free to take or not to take, just as you see fit. Many of these peices are the results of the Committee's activities, and



may serve as examples for you.

In any case, the Committee began the formation and development of a model smoke abatement ordinance, and incidentally incorporated into that some ordinances as a standard for the control of fly ash emission.

It has taken a considerable length of time to develop, as most Committee activities do. In fact, it was not until 1949 that the ordinance was first published. But it met with a wonderful welcome on the part of many municipalities in this country. There was a great demand for just such a document. It sets forth certain standard feeders which have been incorporated into practically all municipal ordinances in the United States today.

Unfortunately, it has now become somewhat narrow in its scope, because since at least 1948, and probably before that, we have been interested in air pollution in a much broader sense. That is, we are much more interested in other things than smoke and fly ash than we were before.

So the Committee has now engaged itself on the design of a model ordinance for all air pollutants, and it is actively engaged in bringing the present ordinance up to date and extending it



and broadening it into all fields of air pollution. This is just one of the Committee's activities.

DOCTOR EVIS (Secretary): Excuse me, is there any chance of us getting the benefit of your revision before the end of this year?

We are thinking that perhaps the Committee may want to recommend that legislation be introduced in January, and if we could have the benefit of your thinking, it might be very helpful.

THE TOASTMASTER: I will be glad to. We will next meet late in November, and I will send you the results of the meeting at that time.

DOCTOR EVIS (Secretary): We would appreciate that.

THE TOASTMASTER: When I say that this has formed the basis for most municipal ordinances, I overlook, of course, the most recent developments in certain areas, particularly in Pittsburg, where a broader conception of pollution came forth, in St. Louis, and in New York.

But, in general, if you look over the municipality ordinances in this country, you will find that more than 90 percent. of them are still based on the A.S.M.E. model.

After the smog of 1948, the Committee,





recognizing that the problem had broadened considerably, together with the publicity about Los Angeles, appointed a Committee on Air Pollution Controls. This committee is made up largely of Society members, but it also has representation from other societies, with corollary interests.

Also, we have liaison with groups which have committees. So we have made an effort as far as possible to avoid duplication of activity. In spite of that, there is still a great deal of it, as I am sure you will have noticed when you went around. We have a fantastic amount of duplication in the field of research.

One of our most important publications has been a report on research in air pollution.

The first one came out in 1953. At that time, by questionnaire, we ascertained that there are some thirty-seven universities, or colleges, or research institutes actively engaged in research into air pollution problems.

Originally, we planned to put out this report every other year, but we are moving so rapidly in this field that we decided we had to do it every year, so the next came in 1955, and this year we have another; so that on this table you will find



a third edition of our report on research on air pollution.

We have found that some sixty organizations -- and I restricted these to the responsible institutions -- not some laboratory somewhere doing work, but universities and colleges or formal institutions that are doing work in this field.

The Committee set itself up with a series of working subcommittees. The main group acts mostly on policy matters. The executive work is done primarily by the Executive Committee. In 1952, they decided there was so much to do, they really needed a full-time secretary to do it. At that time, I came here as Secretary of the Committee.

Since then, the work has been carried on well by the subcommittees themselves, so I am now only part-time as Executive Secretary of the Committee, and the work is progressing very well.

Among the other subcommittees are committees on research itself. We have underway now a project to look into the department of sulphur dioxide and other sulphur stack cases, which are becoming quite a serious problem in this country, particularly for the power people. Many of our activities do relate to the power industry, and of course this



is one of them.

The increasing sulphur content of fuel, both liquid and solid, is creating a serious sulphur gas problem for the power people.

For example, late last summer, the Southern California Edison Company completed a \$30 million power station, and when they applied for an operating permit to the Los Angeles County Air Pollution Control District, this was refused on the grounds that they were going to operate on fuel that was a refinery residue, very, very high in sulphur, which was one reason they did not want any more sulphur dioxide in the Los Angeles atmosphere.

The second was that they also discovered that nitrogen oxides are important in the production of smoke in Los Angeles.

So this Company, with a \$30 million power station, was refused permission to operate.

Since then, they have agreed to spend \$1-3/4 million on research in this problem -- not on controls, but just on research -- in return for which the Department granted a temporary operating permit for the station.

I cite that only as an example of how



important this problem is becoming. I can tell you of others, but I think this will suffice.

However, my Committee, in recognizing this problem, has set up a research project which will place some work on the Research Institute early next year on this problem.

Similar activities, such as our report on research of the other committees, are depicted in more recent publications. One of them is on instruments used in air evaluation.

We found, for example, many companies or individuals faced with problems in air evaluation that do not have an idea of how to go about studying it. They could, of course, employ the services of a consultant, but if they had technical people on their own staff they might wish to do this themselves. So we set about turning out a report on the availability and the location of manufacturers or agents of instruments for this purpose; and you will be interested to know, and I was quite surprised to find, that there are over 200 manufacturers of air pollution instruments in the United States.

We are now engaged in putting our another report which is somewhat similar to that on instruments, on the equipment for the control of





air pollutants; and again I was surprised to find out how many there are, and the great variety of equipment they turn out.

But by using some discretion, we limited these to prime manufacturers of what we thought were pieces of somewhat scientific construction, and that report will be ready soon. We will be glad to send it to you when it comes out.

We also have a subcommittee on fuels and fuel burning equipment, and they have since, by fission, formed another subcommittee which discovered an important problem under their jurisdiction, and that was on incinerators.

We now have a separate subcommittee on incinerator design standards, because it has been found that part of the difficulty in the incinerator problem is due to the very poor combustion efficiency of the devices, and this is related to their design.

MR. MACAULAY, Q.C.: Do you have any report on that yet?

THE TOASTMASTER: We have some. Furthermore, the first report we turned out has been used by the Federal government in their air pollution activity to support three separate research projects.



THE CHAIRMAN: You do not have, for example, any of these reports available?

THE TOASTMASTER: Yes. The first report of the Committee was used by the Federal people in laying out research for work on incinerators. I do not know all the places you have been to; but there is a project at Columbus, another one at the United States Bureau of Mines at Pittsburgh; and there is one other which I cannot for the moment recall, but, anyway, on the basis of that one subcommittee's reports, these projects were started by others than ourselves, so we feel it was quite a worthwhile thing to get started.

We have also, as I say, this work on fuel and fuel-burning equipment, and this is related primarily to the factors which are important in proper burning of fuel oil -- which is also becoming quite a serious problem.

Among other things, we found we should do educational activities. We hold sessions at all of the annual meetings of the Society at which scientific papers are presented on air pollution problems. We are having one next month. We stimulate papers at other meetings of the Society. For instance, local groups are stimulated to give



papers on this subject at local meetings; and in 1954, we held here in New York the first International Congress on Air Pollution, at which we presented papers by authors from seven foreign countries.

I think we had two Canadians, we had three or four Britishers, we had two papers from Holland, one from France, one from Portugal, two from Italy, and so on, besides, of course, a number from the United States.

MR. MACAULAY, Q.C.: Professor Allcut from our country, presented a paper, did he not?

THE TOASTMASTER: I do not recall. We have had papers from Professor Allcut.

MR. BELYEA: He was not there at that time.

THE TOASTMASTER: We had one of them at the annual meeting in 1953. We had one -- and I apologize for not remembering his name -- from the Ontario Research Foundation -- and there was one other Canadian paper. We have had very nice liaison with Canadians. Professor Allcut is a member of my Committee and so is Mr. Newbury.

We propose to hold another international meeting, probably in 1958 or 1959. We were engaged to hold it next year, but the Air Pollution Control





Association, which I believe you visited, is holding its jubilee meeting next year, and we do not want to detract from that in any way. So we shall probably hold our meeting in 1958 or 1959. We already have some of the papers lined up.

I do not want to take too long to discuss the Committee. We carry on, of course, a tremendous amount of correspondence with members of the Society, with municipalities, with consultants, with groups of various kinds. I attend quite a few meetings in an effort to carry on this activity and try to assist in preventing duplication of effort.

We have not been entirely successful in that, and I deplore that somewhat. I hold membership in other committees as an effort in our liaison work.

I will be glad to answer any questions as to how we might possibly assist you. We have a collection of ordinances. Every ordinance I ever heard of we managed somehow to get a copy of, but they are, I find, to a great extent, similar. I hope that when you write yours, you will not do, as many cities do, just sit down with a copy of several ordinances and scissors and paste, and put something together, because that sort of thing is



unfortunate. It may or may not sit your situation.

For instance, Honolulu, early this year, was about to adopt an ordinance, and it was sent to us for information, and lo and behold I found it was the Los Angeles ordinance word for word. It may or may not fir their situation out there. They have since undertaken a study in Honolulu to cover what the problem is before they actually start to write an ordinance.

MR. MACAULAY, Q.C.: How long do you take to review the ordinances that may be sent in to you?

THE TOASTMASTER: I did not read half a dozen words.

MR. MACAULAY, Q.C.: But if we, too, ingeniously produce one, how long would it take you if we sent it to you, for your study?

THE TOASTMASTER: Of course, you might wish to ask several members of the Committee for their opinion, because we have specialists, but certainly within a month we could give you an opinion on it. We could give you a superficial opinion even earlier. Quite often, just by glancing at it, I can tell it is something they have put together.

The other day, I saw one where they had cut out the definitions from one ordinance, and the



rest of the ordinance was from another source, and some of the definitions did not appear except in the definitions. It overlooks the point that problems may be unique, as in Los Angeles they are. The ordinance in Los Angeles may not fit other situations; and the same is true of other cities.

So I know, by these visits, you have seen the variety of problems we have here. You have some idea of the nature of your own problem. If you have not, I have suggested one way of setting about the process of producing wise legislation. In any of this work, we would be very happy to assist in any way we can.

If you have no questions about our particular work, I would like to ask Mr. Hess to tell us something about the Inter-State situation, because our time is limited.

MR. HESS: Gentlemen, although the Inter-State Sanitation Committee was authorized to undertake a study some months ago, there have been various matters interposed which have prevented our doing so, and until they were overcome we were unable to proceed. It is only in the last few days that we were truly able to get ourselves under way. So I presume there is very little that I



can tell you in the way of our accomplishments that would be of value to you.

I, however, feel that possibly, since you are thinking in terms of developing legislation, you may have some interest in some of the background from which our work has evolved.

In the first place, the Inter-State Sanitation Commission was organized some twenty years ago for the purpose of providing for the abatement and control of water pollution in the inter-state area around this metropolitan district, composed of the three States of New York, New Jersey and Connecticut. We have been actively engaged in that, and feel we have done a pretty fair job.

Some people have been very kind to us and have said very, very complimentary things about the work we have done. In doing that, we naturally met with, and, I hope, earned, the respect of many agencies in the three states in this area.

As a result of that, the legislatures of the States of New York and New Jersey determined that, since there was considerable public demand regarding inter-state air pollution in this area, the matters might best be studied from an inter-state





point of view by our Commission.

This Commission, as you will recognize, is basically water pollution control. The more we want into the subject, the more we recognized the great similarity between the subject of water pollution control and many of the problems which appear to be facing us on air pollution.

The legislation finally adopted, and under which we operate, provides that the Commission will make a study to determine whether air pollution is an inter-state problem and if it is, to make recommendations as to the means of controlling it -- again from the inter-state point of view.

MR. MACAULAY, Q.C.: May I first ask, when the Commission was first set up, was it a Federal body?

MR. HESS: It is a tri-State agency established by the three States by contract or inter-state treaty.

MR. MACAULAY, Q.C.: So, if it produces recommendations, they will be multilateral? They will depend on what states come to adopt them or not adopt them?

MR. HESS: Definitely.

MR. MACAULAY, Q.C.: Two may adopt them and one may not?



MR. HESS: That is true, and actually we are again, curious as it may seem, following that water pollution precedent, in that this air pollution study is being financed by the states of New York and New Jersey and not by the State of Connecticut. They feel that it is not a problem up there at this time.

The same thing happened in water pollution. The tri-state contract was functioning between the states of New York and New Jersey for five years before Connecticut became a party to it, although the original contract made provision for Connecticut entering at a later date.

In any recommendations made by the Commission, it is recognized that the Commission has no authority whatsoever to exercise any control over air pollution at the present time.

The Commission has recognized in water pollution, and again recognizes in air pollution, that we have a multiplicity of agencies involved. The same is true of water pollution.

In other words, we have state water pollution agencies, the municipalities themselves have certain water pollution control responsibilities and authority, and likewise down into our counties.



I presume -- I think this is going to be a reasonable presumption -- that the Commission will act on air pollution in the same manner as it has on water pollution, and that is to make every effort to avoid duplication. In other words, I would expect that we will proceed as a co-ordinating agency rather than a duplicating agency.

In water pollution the Committee, although it has certain authority to order the abatement of water pollution, has always attempted to act through the cities or the agency which is closest to the problem.

MR. MACAULAY, Q.C.: By "water pollution", Mr. Hess, to what kind of pollution are you referring?

MR. HESS: Basically domestic sewage and industrial wastes that are discharged into the tidal waters of this area.

MR. MACAULAY, Q.C.: By "tidal waters" how far back up the stream or the river might you go?

MR. HESS: The contract definitely defines the area over which we have control, and also provides that each of the states is responsible for bringing the waters of any stream into interstate sanitation distribution with a quality equal to district waters, thereby making the states





responsible for taking care of the streams which are involved.

MR. MACAULAY, Q.C.: So it is an indirect control over the inland waters, even though it is only indirectly over tidal waters?

MR. HESS: True. Indirect, if you conceive it in the sense of absolute order and compulsion. However, the Commission in its twenty years of activity, has been working so closely with state agencies that it is today in some position to deal with the problem of who is responsible.

There have been so many cases where we have merely indicated a condition to a state, and the state "takes the ball" from there and handles it.

Our air pollution problem, we hope, will be followed along another line, in which again we fall back on the water pollution experience. I cannot say that this is the pattern it will follow but again, if we follow along what has gone before on water pollution, we might expect a similar pattern in air pollution, and that is that, particularly in the case of the state of New York, in developing an intra-state Water Pollution Control Act, in which I took a part, they developed that Act as a result of many hearings and advice from many sources.



They developed it as a result of hearing the opinion of the public as well as hearing opinions of industry, and they drafted an Act after having many conferences and developing many committees and subcommittees on which all of the phases of water pollution were heard. They have developed an Act in which they truly hammered out on the anvil of public opinion, with the result that they finally came up with a recommendation for an Act which was endorsed . . . .

(page 2523 follows



in the legislature of New York State and - which is almost impossible to believe - was adopted unanimously, notwithstanding the fact that it provided for certain controls over industry, over municipalities, over all polluting agencies. It gives promise of being a most satisfactory way of handling the problem.

MR. MACAULAY, Q.C.: How does industry receive the efforts of these committees and commissions? Are they receptive and cooperative, or are they fighting to the last ditch, or how would you categorize their interest?

MR. HESS: On water pollution, after industry thoroughly understood the problem, they gave very full support to the legislation, - which was of course reasonable. That was the important point.

MR. MACAULAY, Q.C.: What did you have to do? You say that they fully understood. What did you do to make them fully understand? What did that involve?

MR. HESS: In that case they had a representative of industry in the form of ---- I am just trying to recall the name of the industry.



DR.EVIS (Secretary): Would it be like our Canadian Manufacturers' Association?

MR. HESS: It would be something like a manufacturers' association. It was a State group. They participated in it very fully and most cooperatively.

THE CHAIRMAN: Is it not a true statement to say that, in general, industry has been more cooperative than most of the municipalities, at least as far as water pollution is concerned?

MR. HESS: I think it is too large a generalization to make any statement of that kind, but I think it is fair to say that industry has been most cooperative. I think there are cases where you find, particularly among the smaller industries, less cooperation than in the larger industries, but the larger industries have been most cooperative in many cases.

MR. MACAULAY, Q.C.: Do you mean to say that initially they were, or only after a while they came within the orbit of your pleasant personality?

MR. HESS: Well, thank you so much - I think it is a matter of knowledge on their part.





THE CHAIRMAN: For industries the quality of water is a very important feature in many cases, so sometimes they feel just as badly about their competitor above stream polluting it as someone below them does. So it is a question of cooperating to achieve a degree of equality all along the line.

MR. MACAULAY, Q.C.: Was it a six month or half a day period of education?

MR. HESS: In my own inter-State legislation, my recollection is that there was a two-year period in developing the legislation, but I could check that more definitely. But it would be not less than two, and not more than four or five.

MR. ELLIOTT: Are they elected for a four-year term?

MR. HESS: No, two years. That is the State legislature.

MR. MACAULAY, Q.C.: Are there many lobbies for or against the legislation in connection with air pollution?

MR. HESS: Well, in the air pollution field I cannot answer that question directly. The inter-State Sanitation Commission did not seek



this job that we have. As a matter of fact, many of our Commissioners sought to discourage receiving the assignment. The legislators sought out the Commission to give them this job.

THE CHAIRMAN: You have to differentiate, you say, between these inter-State problems and State legislation. There is, for instance, in the process of development a City law in New York, and in that case there are definite lobbies. I don't know about this other.

MR. HESS: I think your question on the State problems of air pollution might very well be put to the New Jersey folk. I understand you are going to see them on Thursday, and that may be a very pertinent question to ask them, because I think they are probably in a better position to answer it.

MR. ELLIOTT: Have the people in New Jersey been quite cooperative?

MR. HESS: We expect full cooperation from them. I have no question in my own mind whatsoever that we will receive the fullest cooperation from New Jersey.

THE CHAIRMAN: By "New Jersey" he means the official agencies.



MR. ELLIOTT: Yes, I mean the official agencies; and I am particularly concerned about industries.

THE CHAIRMAN: Well, you have not had anything to do with them really, in a sense, yet.

MR. HESS: We have nothing to do with them now. Our job - again as we are anticipating it, and this again is nothing that we should not say publicly - I would presume that the Commission will feel that merely a report in itself is rather a useless gesture; that the report should provide, not merely an ideal solution or a solution that the Commission itself may feel is proper, but one which is again hammered out on the anvil of public opinion, which will be reasonable from the point of view of all of those who may be involved in the result. I cannot say at the moment whether there is going to be any recommendation at all. It may be found that the present agencies, acting as they are, in themselves carry out the functions and that there is no need for inter-State coordination. I think again that we will have to hear more of the background and get the ear of the people as well as the agencies to find out what the best solution is to the inter-





State problem, if there is an inter-State problem, which is something that we should prove before we jump to conclusions.

MR. MORNINGSTAR: In other words, your Commission is something like ours from the Province of Ontario. I mean, you are investigating?

MR. HESS: Our investigation is two-fold. If there should be any form of inter-State coordinated action, then a technical report on which that coordinative action is based is essential. That we found in the course of our own activities, and that is one of the first cases we had, - the question was raised as to whether or not the district over which the Commission has control was a proper one, or whether the legislators had given adequate consideration in the definition of that area; and the Inter-State Sanitation Commission on Water Pollution is the result of a similar Commission study and recommendations, and that technical report was the basis on which the Commission was formed and is the basis on which we were able to show that the legislature had been given adequate data on which to base their action, and that they had not acted precipitantly and without due consideration. So that again,



the report would have a two-fold purpose.

In our activities we have just engaged Mr. Mallette as our Technical Consultant, and we are going to pull him away from his part-time work there and "stick him" with a lot of extra work. He is going to have to "burn the midnight oil" with both hands. Mr. Mallette, of course, was selected for the job after a rather careful consideration of qualifications, his qualifications and those of many other people in the United States, and we are very happy that he is going to be with us. He is going to take a big load off my shoulders.

MR. MACAULAY, Q.C.: What does his job entail, Mr. Hess, with your Commission?

MR. HESS: He will be functioning, of course, with me, and will be directly in charge of all the technical activities of the study.

MR. MACAULAY, Q.C.: What kind of things will you do?

MR. MALLETT: Well, we will undertake a field study because one of the questions which the law asks us to settle, is, first of all whether any sort of problem exists. The second is to determine the sources and extent of the pollution, if any, in the area. So we are



getting around now to setting up the field work. Then we will do meteorological studies, quite extensively.

MR. MACAULAY, Q.C.: What about water pollution?

MR. HESS: You have misunderstood. I had the feeling right along that you were confusing the work. The inter-State air pollution problem was - I don't know how to put it - foisted upon the Inter-State Sanitation Commission, because they already existed as an institute which was doing an inter-State job. But the two functions are entirely separate.

MR. MACAULAY, Q.C.: That poses the question as to whether they can, in an administrative way, be joined. Can they be?

MR. HESS: That is a problem to be considered later.

MR. MACAULAY, Q.C.: What is your own view?

MR. HESS: I don't think we are prepared to make any recommendation at this time. The purpose of our study is to determine first whether or not an inter-State agency is necessary, and if it is necessary, ---

MR. MACAULAY, Q.C.: Assuming that it is necessary, do you think that air pollution and



water pollution can be joined together in one administrative body?

MR. HESS: It depends entirely on the problem. If you ask whether the New York City air pollution and water pollution problems should be centered in one agency, ---

MR. MACAULAY, Q.C.: How about an answer to that specific question?

MR. HESS: I think maybe somebody in New York City is in a better position to answer that than I.

MR. MACAULAY, Q.C.: You are as cautious as the Doctor.

MR. HESS: I don't think there is any pat answer.

MR. MACAULAY, Q.C.: We have a water pollution problem, perhaps, and an air pollution problem, and I am just wondering if they can be well handled at the same time.

MR. HESS: I don't know.

MR. MACAULAY, Q.C.: What do you say about that Mr. Mallette?

MR. MALLETTE: I think these pollution problems, if they are important enough to get up to official level, should be handled each by





agencies who have as their own sole responsibility one kind of pollution. It may be that the people they talk to in some instances are the same people, but the fact is that the water and the air experts are not necessarily the same kind of people.

MR. MACAULAY, Q.C.: Does this new water commission that is set up in our Province cover pollutants?

DR. EVIS (Secretary): It covers pollutants. I think what Mr. Macaulay is driving at is that can a commission set up by the Provincial Government to take care of the water pollution situation in the Province be given an air pollution job too.

MR. HESS: I certainly subscribe to what Mr. Mallette said, that water pollution is an entirely different problem from air pollution. They are two entirely separate things. The man who knows water pollution does not necessarily know air pollution; and the other way is also true. They are just as different as a pediatrician and a cardiologist. Both of them are in medicine, but they are in separate fields. Both of these are in engineering, but they are in separate fields of engineering. Whether or not there should be one administrator to handle the two is an entirely



different subject. I agree with Mr. Hanauer that water pollution is a very definite field, and air pollution is another field. There are similarities, both air and water are fluids; both of them are moved beyond the confines of any municipality or district or public division; they move forth and back over municipal and State lines. There are many, many similarities. But the means of control undoubtedly are entirely different. They are two highly specialized fields.

DR.EVIS (Secretary):..Up in the area we come from they are really international, and you have an international problem.

MR. MACAULAY,Q.C.: They are both international, as far as that goes, but water is far more international than the air.

DR.EVIS (Secretary): Oh, I don't know;at Windsor and Detroit they pass back and forth; and Sarnia and Port Huron, and Sault Ste. Marie.

MR. MURDOCH: May I say in the first place that I am happy to be filling in for our chairman this afternoon, and point out that our chairman is at another luncheon meeting today, as well as our Minister of Mines, who has been going around with us and whom you have met.



We are opening an office in New York and our Minister of Planning and Development is in the City; so we really recognize this big City today! We do appreciate the wonderful help that has been given to us in New York, and we have found that, of all the places we have gone to, we have received more real instruction on some of the things we are trying to do - that is, introduce legislation to handle the problem - than anywhere else we have been. While we are a little behind you on some matters in the Province of Ontario and are seeking advice from you, as it were, when it comes to this matter of water and sewage I believe we are a little bit ahead, in this way, that we have definitely set up a Water Resources Commission for the entire Province of Ontario which we intend shall clean up our pollution in our waters, and we also intend to finance or help the municipalities finance projects which we think will be too heavy for them to carry. For instance, the City of Windsor has a sewage disposal project which will cost \$25 million, and the one at Sarnia will cost about \$15 million. Along with the cleaning up of the water is the installation of water works





on a big scale, and a grid system which we think will ultimately cover the Province. My personal opinion is, like Mr. Hanauer's, that these matters are certainly entirely separate. It is a different course of study. You just "muddy" up the water if you try to get them together.

MR. HESS: As far as the Inter-State Sanitation Commission is concerned, the reason we have been thrown into this thing is that we were already set up as an inter-State Commission. We recognize that we had no knowledge of air pollution whatsoever. Our knowledge of air pollution sits at the head of the table now. But we did have a knowledge of the inter-State problem, and the background of this business of hammering out, shall we say, an answer to the problem by trying to get all the people involved to come together. That is part of the public education that we are talking about, because it is only with the co-operation, with the opportunity of all of the various classes to come in and have their problems heard and recognized, that you hammer out a solution which is reasonable to all sides, - reasonable for the protection of the public, reasonable in the sense of having controls that are not going



to drive out of your area certain industries or certain classes of people. When we first went into water pollution - and again I have to bring in the parallels - some members of the Commission were anxious to immediately issue orders upon every pollutant in this area. My comment was that the simplest way to clean up pollution was to drive industry out of the area, and if you drove industry out of the area you would drive out those who were supported by the industry, and by driving people out you would have no reason for a pollution problem. That is a very simple solution to both water and air pollution. If you drive the people out of the area, you do not have a problem.

MR. MACAULAY, Q.C.: It is an over simplification of the reality, is it not, Mr. Hess? What actual representations were made to you, can you remember? We had them made to us by industry, that if we were try almost anything they would move away. Were you told those things? And secondly, if you were, did you find that when you did try something that was moderate, they did move away?

MR. HESS: That threat, of course,



is very frequently suggested. We found, not so much by industry, but by other people being concerned about it, not the industries themselves. The Mayor of the Municipality might be concerned about industry moving out of his town more than the industry itself. Apparently we had that more frequently than industry itself threatening to move.

MR. GORDON: Loss of assessment?

MR. HESS: Yes.

DR. EVIS (Secretary): In controlling water pollution, can you think of one example where an industry did move rather than comply pollution controls?

MR. HESS: Not that I can remember in my district. We have not been too tough on industry in our case. You realize how slowly we have moved on this thing. Of course we have a huge problem, and sometimes I think we have moved very slowly, yet we have done a tremendous amount of work in 20 years to cover about 40 years of pollution in this area, and we have now got to the point where we have 60% or 70% of this area adequately treated - 60% or 70% of the pollution removed. It has meant an expenditure of over \$200 million up to the present time, and it has



taken twenty years to do that. These things do not move over-night. So we have been moving on municipalities with the idea that if a municipality put in adequate sewage treatment, frequently an industry, because of the size of our municipalities, would discharge its waste into the municipal sewer system then through the municipal plant, and not affect our waters. In many cases the municipalities are requiring pre-treatment of sewage before it goes into the sewers. I do not know of any major case of industry moving out.

MR. MACAULAY, Q.C.: What about you, Mr. Mallette?

THE TOASTMASTER: I don't know of any case, although I have heard that, I think, at every hearing I ever attended in which any restrictive legislation was proposed. Although I have always heard that said, I do not know of a single instance where it was carried out. I have heard it in Los Angeles. In Ohio they said the same thing. I have heard it many, many times, but I have never known of a single case where a plant was moved.

MR. ELLIOTT: The manufacturers themselves are cooperating, are they not?





THE TOASTMASTER: In general, I think they are. And, of course, the cost of this is always passed on to the consumer. While they usually will object violently because they say, "Some other competitor over here is not having to apply these restrictions which you are placing on us, and therefore you are placing them at an unfair advantage", I think that that in general is not really enough to worry them. But they always use that as an objection. However, these costs are always passed on to the consumer. He is the one who is demanding these things, so he is going to pay for them.

MR. MACAULAY, Q.C.: That is an interesting observation you have made. You say, "The consumer is demanding these things." How do you know that, if there is no public education?

MR. HESS: I think it is a very subtle thing which is difficult sometimes to detect. There is in this country right now a very definite public opinion on the subject of air pollution. I think it started with the D.... smog because they frequently will say that this might happen again in some other community. This carried on longer than the London smogs. Last year "Fortune"



magazine had an article on air pollution, and the writer spent several days with me before he composed it, I presume, and after he had looked over a great deal of material he said to me, "Is the problem really worse, or do people just think it is?" I said, "I think it is both . There is no doubt, because of more industrilization, because of increased population, because of automobiles, because of all these things, the air pollution problem is worse, because you can look out and see it and compare it with your past experience. On the other hand, the people themselves have changed"; and I quoted several examples of which he used one. There is a small town in Pennsylvania which has a single industry. The industry has been there for the last 80 years, and all that time it has not changed. It is a process to make caskets, and evidently there is no major change in the production of caskets. They have a boiler house, and the boiler house has not changed particularly. In all that time everybody has been living side by side with it without very much difficulty; but last year, one night, the housewives of the city descended in a body on the Town Council



and demanded that something be done about the soot from the boiler house. Nothing had changed in the town, except the people. The City has always been there, and they were used to it. It is one phase of the public demand for a better standard of living. We went through the thing with drinking water, we went through it with sewage disposal, we went through it with milk, and a number of public health activities; and this, I think, is just more evidence of it. And while it is difficult to quote examples to show that the people in general demand these things, because you cannot pick them out, there is an undercurrent of feeling about it which is really quite patent. Last year and the year before in the United States there was much greater activity in the legislative field. I tried to keep track of the Bills just in the State Legislatures, and it was almost impossible to do it, and I disregarded all except the more important communities, the municipal and State activities. It is fantastic the amount of legislation. Legislators do not do this by whim; somebody, somewhere, is putting it in their minds.

MR. HANAUER: You might point out the





concrete evidence which you get by virtue of the interest in smog news. The papers do not print stuff about air pollution unless their readers want it.

MR. HESS: That is very evident.

Starting several years ago, just merely to inform my own Committee, I wrote a one page newsletter to them and I did it by reading over magazines and newspapers and so on. Finally I subscribed to a newspaper clipping service. I gave them "smoke pollution" - two words - the thing I wished to bring before the Committee and I had to restrict the amount of stuff I could take. I was getting it in bushel baskets. This was public response. We now take news clippings and incorporate them in a publication twice a week. We just select the cream. What I try to do is get representative items. If you look in here you will see the kind of thing we are publicizing. As Sylvan says, the newspapers do not print these things unless there is some public interest in them.

I would like to comment just a little, drawing on my knowledge of water pollution, on the subject of air pollution. I am inclined to



believe that it goes beyond solely health aspects. Here is a story I have told over and over again which, frankly, ties some of this up in a knot. We have no absolutely agreed medical evidence that can be pinpointed that bathing in polluted waters will create a health hazard. You do not swallow polluted water intentionally, or if you do, you may take one gulp of it. If you took one gulp of it you might take enough microbacterial organisms to make you think you were drinking water just beyond our accepted standards in the United States on potable water, - just below that standard. But by and large, except for some of the streams in the far east of this Country, and I think the same is true in your Country, it would be very hard to prove an actual tie-up between bathing in polluted waters and incidents of disease, - not drinking, bathing. The question arises as to why go to all this extreme of abating pollution, go to the cost of so much treatment for bathing, because we in this area are surrounded by salt water, and we do not drink salt water; so why all this money for bathing. The story I have told frequently is that in one particular area the pollution was so bad that if a person the next morning, instead



of taking a shower took a tub bath, and before putting their feet in the tub took a milk bottle , filled it with sewage from their own toilet bowl - if they wished to, so it would be a personal and not a public matter - and poured two bottles of it into the bath tub, the question I pose, is would you bathe in that water? Someone asked the question, "Well, what degree of pollution is satisfactory?". To which I said, "Don't put two bottles in, put one bottle in, or cut it down to half a bottle, or a pint, or half pint, or just a whiskey glass, you tell me how much of that pollution you want to put in your bath tub to bathe in". And that is the answer. I think you are going to find the same thing is true in air pollution, and that, I think, is what you are getting in these reactions we have been speaking of, these public reactions; that is, it is not tied down solely to the medical aspects, but it is very definitely a public reaction to nuisance, the desire for a cleaner, better, fresher life. I think that is what we are faced with.

MR. ELLIOTT: Then, with the increase in population and the growth of industry,



you are going to have greater pollution. ....

MR. MURDOCH: As I have said previously, we are now in a position of having to study everything that we have found, and present our report. Of course we will have to get some kind of suggestions with regard to specific legislation to cover the situation.

THE TOASTMASTER: You have not reached that stage yet?

MR. MURDOCH: Not quite, no; and of course we appreciate what we have learned here in this way. Whatever we do must cover the Province of Ontario. By that means you get away from the business of industry moving from one municipality to another.

MR. THOMAS (Oshawa): There is just one question I would like to ask, Mr. Mallette. We have gathered all this information from different cities in the United States and Canada, and we have always been treated very, very well indeed. But one of the Members in particular, and perhaps two, feel that we should visit Europe, probably England or Germany. Do you think the situation is any different over there than what it is in the United States or Canada? Do you think we





can gain any great knowledge?

THE TOASTMASTER: Except that your traditional law is perhaps somewhat more closely related to them than it is here. Just in the matter of nomenclature alone, I note, for instance, I should have said, "Bylaws" instead of "Ordinance"; perhaps it would have been clearer. There are just these little subtle differences. There is now a new British Bill, the Clean Air Bill, which presumably will guide you somewhat, although personally I do not think your problem is enough similar to that in Great Britain to help you very much. In fact I think it is somewhat different, in that you do not have, as far as I recall, the domestic contribution that they have, for instance, in London. But there is mention of a meeting in February in London which you might like to attend. It is very easy to get over quickly now. I am thinking of going myself. It is a meeting of the Institute of Mechanical Engineers; they are having a pollution meeting in the early part of February. It is a very well designed meeting. You might find that of interest.

MR. ELLIOTT: They have been studying this for many years.



THE TOASTMASTER: Smoke and fly ash, yes. Air pollution only recently. And now the Clean Air Bill which is directed primarily at smoke.

MR. MURDOCH: You might send us information about that meeting.

THE TOASTMASTER: I will be glad to.

When I was over there in 1954 they wanted me to spend a week at one of their plants. Unfortunately I was unable to do so because of my reservation. I said, "Is there not someone here who can do it?". They said, "No, only one man in the governmental group". So you see they have not done very much in the line of air pollution work; their work has been primarily with smoke and fly ash.

But they are getting into it, because I notice in this program the papers are quite wide in their scope.

MR. MURDOCH: What are your views with regard to taking the positive approach by calling it, as they did in England, a "Clean Air Bill" or calling it a "Clean Air" control division, instead of always referring to it as "air pollution" and "smoke"?



For instance, the outfit in New York is the "Air Pollution" Control Department. Could it not be a "Clean Air" Control Department?

THE TOASTMASTER: Perhaps I have been in this too long to really give you satisfactory opinions on it. There may be something of value in taking that approach. Personally I do not feel that way. As a matter of fact I think sometimes it is negative, indirectly.

You suggest talking about "clean air" when actually what we are talking about is pollution, the thing we want to eradicate. We want to bring in clean air.

I do not think it is important. I think the important thing is to call attention to the pollution.

MR. MURDOCH: So the name of the bill would be better, in your opinion, if we called it the "Air Pollution Control Bill" or something like that?

THE TOASTMASTER: That is just a personal opinion.

MR. HANAUER: I think you can also get the benefit of what the public understands





about the problem if you use words that they are used to reading in the papers. If they are used to reading "air pollution control" this evokes a response immediately and connotes an objective, whereas if you start with a new phrase you have got to do some advertising to get it by undisturbed. That is my feeling about it.

MR. MURDOCH: I would like to interject this thought here in order, perhaps, to get it on the record for discussion at a later time. To get back to water pollution; the Water Resources Commission will enter into an agreement not only with municipalities, but with industry to clean up their industrial waste, and will actually build a disposal plant for an industry, and then charge them an annual rental, - which of course does not need a big capital expenditure on the part of the industry. That is dealing with cleaning up the water.

In the cleaning up of air could not thought be given along the same line, inasmuch as the Commission could install it and relieve them of capital expenditure and charge a fee for the use of it? I just want to put that in as a thought.



THE TOASTMASTER: For the capital cost they would get exemption on their income tax. That would be part of their construction, would it not?

That has been proposed here; that is the fast write-off, but our Federal Government has never seen fit to pass it. But we have had bills up almost every year and the Treasury objects to it.

DR.EVIS (Secretary): On the other hand, in some cases would it not increase the value of the property and increase their local assessment and local taxes?

If they added a capital expenditure of \$1 million, would not the building be worth more and therefore would not their local taxes be heavier?

THE TOASTMASTER: Oh, definitely their local taxes would be heavier.

DR.EVIS (Secretary): I think it is something we should nip in the bud. If they spend money on their pollution equipment, we should make sure they are not penalized for that.

MR. HESS: Have you thought of the abatement of pollution on the part of industry



as just as much a part of their cost of manufacture as having available enough boxes, or bottles, or anything else?

MR. MACAULAY, Q.C.: But that goes to the income tax.

MR. HESS: And likewise, having to make provision for the removal of coal ash and things of that kind from their property. In other words, that is part of their cost of manufacturing.

MR. MURDOCH: It certainly is, of course.

MR. HESS: Could you not have a pollution control under the same head?

THE TOASTMASTER: I think some day we will regard it that way. We are just suffering the penalties of being pioneers in these things. All these things were originally thought of as horrible new ideas; now they are perfectly acceptable. They have, I think, come to face it in stream pollution, and I think they will some day in air pollution.

MR. GORDON: It is a pleasure, on behalf of the members of the Committee, to express to you, Mr. Mallette, Mr. Hess and Mr.



Hanauer, our thanks for making our trip to New York so pleasant and so informative. Since the Committee was set up by the Ontario Legislature, I think 75% of our studies of this great problem of air pollution and smoke control has been in the United States.

We visited Chicago, Detroit, Los Angeles, Philadelphia, and other places.

DR. EVIS (Secretary): And Pittsburgh.

MR. GORDON: And I think that points up the reasons for our visit. Now we have just one or two more visits to make to cities and towns in Canada, then during the Winter we will get down and finalize our report. We will see that you get a copy; and I think it will show more than my words can explain our appreciation to you for the help and assistance that we have had from your people in the United States. It is a very great privilege to extend to you, on behalf of the Members of the Committee, our sincere thanks for your help and hospitality.

We have greatly enjoyed this very delicious lunch with you.

THE TOASTMASTER: You are very welcome, and we are glad to know we have been of service.





---Whereupon the further proceedings of this Committee adjourned to reconvene on Wednesday, October 24th, at 10:00 o'clock in the forenoon at the New York City Operations Office of the United States Atomic Energy Commission, 70 Columbus Avenue, New York.

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P R O C E E D I N G S

of the

SELECT COMMITTEE APPOINTED BY THE ONTARIO LEGISLATURE  
TO ENQUIRE INTO CERTAIN MATTERS AND LEGISLATION  
REGARDING SMOKE CONTROL AND AIR POLLUTION IN ONTARIO.

Mr. A. H. Cowling, Chairman.

Dr. F. A. Evis, Secretary.

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VOLUME XXXIV

Wednesday, October 24th, 1956,

NEW YORK, N.Y.

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R. C. Sturgeon,  
Official Reporter,  
Parliament Buildings,  
Toronto, Ontario.



T H I R T Y - F O U R T H   D A Y .

New York, N.Y.

Wednesday, October 24, 1956.

10:00 o'clock, a.m.

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The further proceedings of this  
Committee re-convened, pursuant to adjournment.

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PRESENT:

Mr. A.H. Cowling, Chairman,  
Presiding.

Hon. Mr. Kelly,

Mrssrs. Morningstar,

Elliott,

Murdoch,

Gordon,

Macaulay, Q.C.,

Thomas (Oshawa)

Dr. F.A. Lvis, Secretary.

APPEARANCES:

Mr. W. B. Harris,

Chief,  
Industrial Hygiene  
Branch,  
Health and Safety  
Laboratory.





The following proceedings were held  
in the New York City Operations Office, United  
States Atomic Energy Commission, 70 Columbus Avenue,  
New York City:

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MR. HARRIS: I think perhaps it  
would be useful to me if someone would brief  
me on what your range of interests is, and  
precisely what we can do for you here.

THE CHAIRMAN. (Mr. Cowling): This  
is a Committee of elected representatives in  
the Ontario Legislature, representing all  
parties.

We are operating on a Provincial level,  
and we are charged with the duty of studying  
the matter of air pollution and smoke control  
and making certain recommendations to our  
Ontario Legislature as to how we can best



control it, and revise whatever laws we have now so that they may be more effective in the future. So it is a broad field, and we would like to know something of all phases of air pollution.

The reason for seeing you is to find out if your operation is something about which we should know.

MR. HARRIS: In other words, you are interested in knowing what kind of air pollution might possibly be generated by any operation of the atomic energy industry.

THE CHAIRMAN: That is right.

MR. HARRIS: Would that also include fall-out?

DR. EVIS, (Secretary):  
Is this strontium 90 fall-out a serious matter or not? Is there any evidence that it is causing bone cancer, the way certain political people here claim it does?

On Saturday night, for instance, we heard Messrs. Stevenson and Kefauver and they said that, "Reputable atomic scientists claim that the strontium 90 fall-out cause bone cancer".

MR. HARRIS: Not "cause"; "may cause".



DR. EVIS, (Secretary):  
No, I think he said it is

causing it.

MR. HARRIS:  
I don't think any reasonable  
person would say that.

(Secretary):  
DR. EVIS: I was talking to a lady  
who just came back from Europe, and she said in  
Salzburg, Western Germany, and other areas, there  
were generalized attacks of nausea, vomiting,  
diarrhea, which they attributed, rightly or  
wrongly, to atomic rain following an atom  
bomb testing by the United States.

MR. HARRIS: You are interested in  
general fall-out.

I presume your interest in that is of a  
general nature, rather than specific, because the  
legislation which you would write would hardly be  
to stop Russia shooting atomic weapons.

(Secretary)  
DR. EVIS: We have had certain groups  
in Ontario presenting us briefs, asking us to  
outlaw all atomic activity in the Province and  
the Dominion. They are extreme groups, but it  
would be nice to have an answer for them.

MR. HARRIS: All right, I will try  
to give that to you.

The first is fall-out; the second



is industrial uses other than power; the third would be power, and the fourth would be governmental activities.

THE CHAIRMAN: If we can maybe finalize it.

In the final analysis, this Committee has to make recommendations or write a new Bill which is going to make the air cleaner in Ontario.

MR. HARRIS: The reason I said what I did initially about your interest in fall-out being a general one, is that no legislation that you can make can have any bearing whatsoever on atomic weapon fall-out, whether it be the exploding of Canadian weapons or United States weapons, or Russia's weapons or anybody else's weapons, or an atomic war. There is nothing that you can do to stop the fall-out if the weapons are exploded, nor is there anything you can do to stop them being exploded.

(Secretary)  
DR. EVIS: We are not that powerful.

MR. HARRIS: So I think we have got to look at this realistically.

In the first place, I would like to continue to carry on a crusade which I have been carrying on





for a long time, and then I would like to define for you something about the hazards that exist with radio-active materials.

The amount of radio-active material which it is possible for us to measure is so infinitesimally small, so much smaller than any other quantitative measurement, that we can recognize radio-active materials in quantities which are almost infinitely below what is considered to be dangerous.

In other words, our measurement techniques - one of the reasons why radio-active materials are so important to us - that is tracer materials, isotopes, and so forth - is because we can measure them down to such an infinitesimal quantity. We can measure what happens in a single cell in the body by putting a radio-active tag on one little element in the cell. The quantities are almost unbelievably small.

We can measure one atomic event per minute, for example, that is, one atom giving up a particle per minute: we can measure it quite accurately, - the curie of activity, which is one gram of radium, and this is the



usual amount that a hospital has in a pellet to do cancer therapy. One curie of activity is 10-12 disintegration per minute. That means 10 followed by 12 zeros, so that we can measure it to a minus 12th, that is 10/000000000000,- that much radium, easily.

This spread is something which makes lay understanding of the potential effects carried over very difficult. The question whether radium is present or not is not important, but how much is "dangerous"?

The Commission - not only the Commission, but many people working in the field of radio-activity - have tried to figure out how much material of any kind, or how much radiation of any kind would be damaging to the human system. This has been based on a rather fragmentary background.

We have human experience with radiation damage. I think this is something you people ought to understand, but it is a question that has been beaten around and really kicked to death.

The information we have on radiation damage to people is very, very scanty. We have a few cases which occurred here in New Jersey



after the First World War, because girls ate some radium, and we know about how much radium they had in their bodies when they died, and we know how long it took them to get sick, because some got sick in 1922, some in 1923, some in 1925; and the most recent was only two years ago. We know how much radiation caused that illness.

MR. MACAULAY, Q.C.: Were they not the women who licked a brush to put something on the dial of a watch?

MR. HARRIS: Yes. They were painting numbers of clock dials, mostly instrument dials I think, and they got radium in their bodies. We have some scanty information, and really not very good information, on some people in Czechoslovakia who worked in mines and died from lung cancer. These girls died from cancer of the jaw, and the men who worked in the mines died mainly from lung cancer. We are reasonably sure that the girls died from radiation, that is from the damage of radio-active material within their bodies. We are not absolutely sure that the men in the mines died from radiation, unless it was together with something else which we do





not quite understand.

But, based on these quantities, and based on some experience which we have with physicians who have gotten radiation does from machines, that is x-ray machines and so forth, we have built up a set of standards, and we say that whenever a person gets so much radiation there is a possibility that he may be damaged.

THE CHAIRMAN: Just on that point, do you know what to do about it then?

MR. HARRIS: No; I think that when damage to the system has progressed to the point where you recognize it there is generally very little you can do about it.

MR. BELYEA: What information do you have on the damage from x-ray machines?

MR. HARRIS: Well, we have two kinds of information.

We have one group of acute incidents, in other words who for some reason or another have got a terminative dose, - "terminative" in a relatively short time.

The other is inferential, based on a statistical study of physicians where we do not know how long the dose was, we do not know how



much the dose was, we just know that if you take a large body of people who are exposed to x-rays you will find an increase in certain diseases.

MR. BELYEA: What incidence of mortality would there be from that?

MR. HARRIS: The incidence of leukemia among radiologists has been stated to be several times what it is in the normal population. I think it is about twenty times what it is in the normal population, which means that if in the normal population you would expect to find one case of leukemia in 100,000 people, among physicians say you would find 20 cases among 100,000 people, or 2 cases among 10,000 or 2/10ths of a case among 1,000 people. This is a difficult thing for the layman to grasp. How do you tell whether you have 20 cases in 100,000 or 2 cases in 10,000? You do it only when you have a vast number of people. These are statistical things which are not readily recognized by the general population, and can only be backed up by a concerted statistical study of each group of people.

THE CHAIRMAN: Mr. Harris was giving us a little talk, and I think we would rather



have him get through, and then he can answer questions and start on the next bit.

MR. HARRIS: I have drawn up in my own mind a set of numbers which I think are possibly of interest, by which we can refer an amount of radiation to something which people may more readily understand; and that is money.

I think we all know what money is, and we all know pretty much what it means to have half a dollar, or a dollar, or five dollars and so forth. We don't know what it is to keep it, but we know what it is to get it.

If you start with the smallest measurable unit of money - this is not a real amount - the smallest measurable amount is a mill, or .001 dollars. It is not an amount that anybody sees or knows about. We know it exists theoretically. The smallest amount of radiation that we know anything about - not something that we can measure, but something that we know about - is the microroentgen, .001 m.r.; and I use the term "m.r." because "m.r." is the general designation that we use in connection with radiation.

The smallest amount of money you can



have in your hand is a penny, .1 dollars, and the smallest amount of radiation you can measure is about 10 m.r., or 0.01 m.r., the amount of radiation which is with us all the time, which includes the amount that comes up from the reclamation of the radium which is normally present in the soil, the amount of potassium which shows the potassium as a radio-active point, and the amount that rains down on us from the sun, and so forth.

When you open up the meter this is what you read. You cannot read less than this without going through very, very difficult procedures of shielding and other things. You cannot measure less than this 0.01, although this does exist.

So, starting with one hundredth of a microroentgen, or a penny, we start building ourselves up - this is a unit of money which today, although it is passed around, really has no value. You never consider a penny as having any substance. I used to when I was a small boy, but today we do not. The smallest amount of money which really amounts to something is one dollar, which is 1.00 times this, or 1 m.r.. This 1 m.r.





has a kind of an income value; in other words, we talk in terms of 1 m.r. as being the kind of thing that a person can absorb and not find any harm from it, every day, every week, every year. This amount of radiation has no affect on the body as far as we can see. Not even in future generations or at any other time in the future do we think that this amount of radiation can ever conceivably damage anything, because of recovery.

In other words, you recover from any damage which is caused by this.

The next step up the ladder is when you get in the range of \$100.00, which brings us to the point where we are beginning to talk about weekly income, with variations up or down by a factor of two or three and you cover pretty much the average weekly income of the general public; say, from \$25.00 up to a few hundred dollars will cover most of the people. This 100 m.r. is about the limit which you can permit an individual to get every week. Again, there are variations up and down from this by a factor of two or three.

Some people will have say 25 m.r., some will have a few hundred m.r., but as far as we know, the person who is working for a



living can stand this much radiation - 100 m.r. - in a week, week in and week out, throughout his life without coming up with any measurable damage.

I will pause a second and say that the reason that people go up and down from this by a factor of two or three is that there are those who believe that such radiation as this, when given to everybody in the general public, could result in very, very minute - immeasurable physiological changes - which, if scattered throughout the general public, could eventually result in some damage to some individual in the future.

These damages **they are talking** about in this range are small changes in the genes, in the reproductive cells in the body; and what they say is that these reproductive cells will be broken, will be rearranged to the point where, when the cell is passed on and joins with another similar disarranged cell, the result can be a degenerated offspring. This degeneration - although I have experience with that from other effects - is generally lethal; in other words it results in stillbirths. The



largest part of our stillbirths are the result of mutant genes, - genes which have been rearranged.

Radiation, we know, will cause this kind of rearrangement and they say that if you cover the whole population you will break enough genes so that eventually two will come together that are similarly broken and this will cause degeneration of the species.

There is something to be said for this, although it is not a point which has been well established. The acceptable number has not been yet established, but in general it is within a factor of ten of this. In other words, no one claims that you have to keep down to below say 10 m.r. per week. It is generally of an order of 25 or so.

In our plants we accept 300 for the workers. Outside of the plants we accept 30 for the general public. This is the level that we shoot for.

This is income. What I have been talking about is transient money, that is money which you can take day in and day out, week in and week out. When you get to higher levels you





begin talking about capital.

The next higher level, as I picture it, is \$1,000.00, where you are not talking about weekly income any more, you are talking about the kind of money that a man has, and again this is 1000 m.r.s, or 1 roentgen. You begin to get into the range where you are talking about storage in the body over a long period of time. Up to here it was per hour or per week; but here it is, how much has a man received. The \$1,000.00 is really neither here nor there, but when you get to say \$10,000., or \$100,000. - say \$25,000. - that is a really substantial piece of money. We are beginning to talk about the kind of thing that a man works for all his life, and saves. This is getting to the point where most of us are happy, when we have ended our life, if we have accumulated at least that much capital.

Now, 25 r. is generally set as being the maximum amount that we would permit any individual to accept in the general public.

(Secretary)  
DR. EVIS: That is over a life time?

MR. HARRIS: That is over a life time.

The amount set in a recent study which has been



published is 50 r., in the first thirty years, - not more than that, and another 50 in the next ten years. So you have 100 by the age of forty, and not more than 200 in a whole life time.

This is also the number that is generally accepted as being an emergency dose. In other words, a man under war time conditions could go into an emergency situation and you can accept that he gets this much at one dose.

This is well below anything which has caused any recognizable immediate damage. People have been exposed to this, and as a matter of fact this amount occurs frequently.

Then we get up to the real rich man's stuff. When you get over \$100,000. then you are a little beyond the range of what the average man ever dreams of accumulating.

THE CHAIRMAN: We have a couple of fellows on the Committee - just average fellows - with a couple of hundred thousand!

MR. HARRIS: Again, this is the bottom of it. The range is from \$100,000. to \$1 million. \$1 million is generally as much as anybody thinks of. Nobody ever thinks in terms of \$3 million, \$4 million or \$20 million. They just think,



"I will get a million dollars". That is 1000 r. That is almost 100 percent fatal. 200 is almost 20 percent, fatal. This is the level at which people will probably get sick, and things will happen like you are talking about, - nausea and vomiting.

MR. ELLIOTT: You are up in the "big stuff",

MR. HARRIS: You are up in the big stuff, between those two amounts. In other words, between 200 r. and 1000 r. it will depend on you whether you are going to get it. At 300 r. it will get twenty percent; at 500 r. fifty percent of the people will actually die.

This is the time scale of radiation, and you see you cover a tremendously broad plane; and it isn't until you get over this ---

THE CHAIRMAN: \$25,000.

MR. HARRIS: .----that you start being concerned about the immediate problem. I must not detract from this small amount of income per week, where possibly in future generations this will show up, and instead of one stillbirth out of 100 there will be two. In other words, they talk about it as an amount



which doubles the mutation rate. This is an amount which, unless you went looking for it, you would never see it. The future generations would go on, and everybody would be happy, but there would still be an increase in the number of stillbirths, in the number of aberrant births, that is, children who were born abnormally. That is about the picture.

Now, to tell you what actually happens in the fall-out from an atomic weapon. We used to have the responsibility for measuring fall-out outside of the immediate area of the test site in Nevada. This is, of course, when they were playing with the little "peanuts". What we used to do was to set up stations to measure the amount of radio-activity which fell to the ground.

We started at about 50 miles away from the site, and actually measured around the whirl, but we used to measure very carefully as the stuff came down, and we used to find a situation like this. When we were right in the path, in other words right down from the stuff, say 100 miles, the radiation level on our instruments would run along like this, (indicating)





and then all of a sudden it would start to rise and then fall like this, (indicating).



To put this in terms of smoke, the maximum value that we ever found outside of 50 miles from the explosion - and I am talking of explosions which went up to say 200,000 tons equivalent, in other words the equivalent of 200,000 tons of T.N.T. - this is ten times what we generally call the nominal weapon, because the nominal weapon is 20 kilo tons. This is about one percent, in other words  $1/100$ ths of the largest weapon that we know of having been exploded, which is about 20 million tons.

The highest value we ever found, the peak, which lasted for a relatively short time, was about 2 m.r. per hour. This was found one time under an unusual circumstance, and we happened to be at the right place at the right time. This was about 300 miles away from the test site, and we had 2 m.r. per hour, and this happened at about 5 or 6 hours, and on this scale it would come down in 24 hours.



There are two things that bring it down. One is that the material normally decays very rapidly, because most of the materials in it are of very, very short life. And also it weathers, that is rain will wash it into gutters and down sewers and away; and it blows away. So the two effects are seen; in 24 hours this 2 m.r. was down below what we could measure; it was not down to zero, but we never got to measuring it because it was below what we could measure.

The component of this with which we have much concern is the stuff that lasts a long time. In other words how much actually exists at the end of one, two, five years? It is what we usually think of as strontium 90 fraction. The reason we talk about strontium 90 is because, in the first place, strontium 90 has a relatively long life. At the end of 20 years half of this is still alive; so compared to the life of a man it has a relatively long life.

Many of these materials have a life time of seconds, minutes, days; but strontium 90 has a relatively long life. That is the first thing.

The second thing is that S.90 is a



rather powerful emitter of beta radiation.

That is, it emits electrons which can damage tissue.

In the third place we are interested in strontium because of the way it acts in the body. When strontium gets into the body the body cannot distinguish it chemically from calcium. They react very similarly in the body. Wherever calcium goes, strontium will go. As you know, calcium is a very important part of our whole living process. So that the strontium will travel along with the calcium and be deposited in the bones where it can bang away and either reduce the blood forming power of the bone, or result in some form of cancer. That is an unusual growth.

I want to get to the other way that we choose our limits. I said that we have very meager data. On the basis of this data we have decided that if an individual gets no more than 300 m.r. per week he is perfectly safe. We have further said that if an individual gets no more than 300 m.r.s per week on any small clump of tissue in the body, he will be perfectly safe. This is a very conservative thing





to say, because if a man can stand 300 m.r. per week over his entire body, he can stand considerably more than that in any individual spot.

MR. MACAULAY, Q.C.: Why? I would have thought it would be the reverse.

MR. HARRIS: No, because if you get it all over, when you get a whole body irradiation of 300 m.r., every cell in the body gets it.

MR. MACAULAY, Q.C.: You do not mean that the 300 is spread over all the cells?

MR. HARRIS: No; every cell of the body is irradiated to that extent, so if you pick out a small group of cells, that small group could presumably get a great deal more.

MR. MACAULAY, Q.C.: Does it necessarily follow?

MR. HARRIS: Let me explain why. Some tissue is much more resistant to the effects of radiation than other tissue. The muscles, you can bang away with radiation and never see any effect at all; whereas the bone marrow, the blood-forming mechanism, if you radiate it, will stop producing blood cells with a similar level. The gonads, for example, if you irradiate them --- this is where you cause the genetic changes, ---



this tissue is much more sensitive to destruction.

THE CHAIRMAN: What were you talking about, the "gonads"?

MR. HARRIS: The testes, and the ovaries of the women; that is, the reproductive organs. These are much more sensitive. Some tissue is highly sensitive. Some body tissue is highly sensitive to radiation, other body tissue is relatively insensitive. So when you talk about 300 m.r. a week to one tissue, you are generally in much better shape than when you talk about 300 m.r. to every tissue in the body.

When we devise our standards, the routine that we go through is to test experimentally with known radio-active elements, where the material goes to in the body. In other words, we decide that if you take in one gram or ten grams or 100 grams of any element, that element will end up dividing so many grams in the muscle, so many in the bone, so many in the lungs, and the blood and so forth. So we get a distribution within a body. Then we get what we call the biological half-life; in other words, what is the rate of transfer, of turnover in the body?



If you put one gram of material in the body, how long will it take before the body will have completely eliminated that and replaced it with another material?

The body is in a constant state of turnover.

Then when we have that figured out we plot the increment of retention against the increment of excretion, or whatever it is, and we say, at this level of intake this organ will reach an equilibrium of so much amount, and at another level of intake this organ will reach another level.

Then we try to choose what is the most sensitive organ, and this "most sensitive" includes how much gets there and how sensitive the organ is to destruction, and we say that that organ shall not get more than 300 m.r. per week. On that basis we say a man shall not eat or breathe or be exposed to more than a given figure; and this is what we call the tolerance level or the permissible level.

Now the permissible level of substantially every radio-active element has been established by this method. It is entirely a



calculation method, and as far as we can see is very, very much on the conservative side. It must be on the conservative side, because we do not know, and until we start getting information we have to be extremely conservative.

However, nobody has ever, from any of these materials, become sick. We do not have any experience. As I said, the only human data we have got is from the old radium cases. We have never seen a bone cancer come from strontium-90. We have seen it in animals, we have never seen it in people, and we have never seen any genetic affects from any amount of radiation except in animals and plants.

So, all of this is conjecture; and when you base a standard on conjecture you have to be very conservative. I believe that we have been very conservative; and when we say that all of the strontium 90 which has fallen over the World has amounted to a total cumulative effect in the worst place which is less than 1/1000ths of the permissible level, this permissible level we are talking about is the amount which we would permit a man to take into his body day after day for his entire life and not expect to find any





demonstrable change in the body.

MR. MACAULAY, Q.C.: How much did you say that was?

MR. HARRIS: It is a figure which I am not sure you will understand if I tell it to you. The strontium value is 2 times 10 to the minus 10 microcuries per millilitre.

MR. MACAULAY, Q.C.: Of air?

MR. HARRIS: Of air. I had better not quote this off the top of the head.

THE CHAIRMAN: Perhaps you can give it to the Doctor afterwards, Mr. Harris.

MR. MACAULAY, Q.C.: In any event, Mr. Harris, you said that at no place in the World had it reached any more than a very small proportion of what you consider to be the standard, in layman's terms. I think you said 1/1000th?

MR. HARRIS: I think that is about the number, - about 1/1000th of what is considered to be acceptable. And I think it is based on the acceptable amount in water. In other words, if the only drinking water that was available to an individual contained that amount, he could drink it day in and day out for his entire life without showing any demonstrable injury; in



other words, without ever having any single tissue within his body exposed to more than 300 m.r., per week.

THE CHAIRMAN: That is the point, - the m.r. - that we understand.

MR. HARRIS: Everything is based, goes back to the number of microroentgens per week.

MR. ELLIOTT: There is some water in some parts of the World which contains that much.

MR. HARRIS: Not of strontium. But this would be permissible. There are certain waters in the World which contain this much radio-activity, - contain much more.

MR. ELLIOTT: There is?

MR. HARRIS: Many, many waters, yes. The waters are largely radium and its descendants; that is, radium and all the things that it breaks down to, so that there are many, yes.

MR. ELLIOTT: On the North American continent?

MR. HARRIS: Oh yes, there are many in Canada. Any place that you have the great fortune to be able to mine uranium you also have, if you



can call it that, the misfortune to be in radio-active waters.

(Secretary)  
DR. EVIS: There is a lot up around the Kitimat mine.

MR. ELLIOTT: It stays in the water?

MR. HARRIS: If you drink it it gets into you.

(Secretary)  
DR. EVIS: It is like oil getting out of the oil-bearing rock into the water.

MR. HARRIS: Let me change that. Some of the material that gives the water radio-activity is a gas with an extremely short life, and it then decays. However, radium and polonium have long enough lives to be significant in radio-activity because radium has a life of several thousand years.

MR. MACAULAY, Q.C.: Do I understand you correctly that you have not been just talking about strontium, you have been talking about all radio-activity, presumably, as to the tolerance level of the body? It is not just strontium when assimilated into a body which can cause the problem of the destruction of the blood cells, or bone cancer? Or is that so.





MR. HARRIS: Every radio-activity.

MR. MACAULAY, Q.C.: This water source you are talking about could be a serious problem even though it might not have strontium in it?

MR. HARRIS: Absolutely.

THE CHAIRMAN: Strontium has the effect on the bone or the marrow?

MR. HARRIS: I will go back again and describe why strontium is important.

MR. MACAULAY, Q.C.: I understand. I just wondered if there were other agents as destructive, only in another way?

MR. HARRIS: Yes, absolutely. Strontium happens to be what they call a bone-seeker. Radium is also a bone-seeker, because radium belongs to the same family chemically as strontium.

MR. MACAULAY, Q.C.: You said, Mr. Harris, there was no place in the World where strontium was found in a concentration greater than 1/1000ths of the tolerable or acceptable maximum. But what about other components? You see, the layman knows very little about this.

MR. HARRIS: I am sorry; I should have mentioned that.

When an atomic weapon is exploded, or



in fact when an atomic process takes place, that is the operation of a reactor, we have what is known as radio-active fission where the source material, uranium or thorium or whatever it is, splits apart. This split starts with an element that has a weight of 235, atomic weight; in other words, the number of individual pellets that make up the nucleus of that item is 235.

It splits in a random fission, and one-half is approximately 135 of these pellets, and the other part is approximately 100 of these pellets. This is a process which is known as fission.

In other words, it fissures and breaks into two parts, and the two parts fall generally into this group of chemical elements. The chemical elements which are in the range of weight 135 can be anything from 120 up to say 150, whereas the ones in the other range can be anything from say, a weight of about 75 up to about 110. Strontium is 90. It is one of these fission products.

There is a limited number of fission products which are produced in significant quantities, this number being 10, which constitute



a significant fraction of the fission yield. So strontium is one of these. Strontium is present in fission in maybe five percent of the total waste. At the end of the week most of these materials are dead, because their half-life is very short. Strontium, however, is still alive because it has a relatively long half-life.

So the combination of these factors, - the fact that it is produced, the fact that it does have a relatively long half-life, the fact that it is a strong emitter, and the fact that it does get to the body and go to the bone, makes strontium important. No other material which has created any fission, with the single exception of iodine, is physiologically as important as strontium. Therefore, we measure for strontium.

We are not interested in the total amount of activity, because the others are, by at least a factor of 10, not biologically significant.

MR. MACAULAY, Q.C.: So if the strontium is not a problem, the rest are not.

MR. HARRIS: That is right. If there is not enough strontium to be a problem there will



not be enough radio-activity to be a problem.

We measure two things, - total activity, and strontium fraction. That map behind you shows the locations in the United States at which we have sampling stations. We are taking samples of the material which falls out of the air at each one of these places within the United States. I am sorry we are not downstairs, but if we were downstairs in our conference room I could show you another map which indicates where in the World we are taking such samples.

We are blanketing the World just about as effectively as that, with a small exception on the other side of the Pacific; but with that exception, and the Soviet block of countries we are effectively blanketing the whole World, northern and southern hemispheres, eastern and western, taking daily samples of the material that falls out, in order to define how much strontium is getting into the environment.

THE CHAIRMAN: Have you sampling stations in Ontario?

MR. HARRIS: We have sampling stations in Canada. I do not know where they are.





THE CHAIRMAN: How many, roughly?

MR. HARRIS: Roughly, 10.

THE CHAIRMAN: So that, when we were becoming concerned up there about the fall-out as a result of your atomic tests in Nevada, it was a fact then that you were taking samples up there?

MR. HARRIS: Oh yes.

THE CHAIRMAN: And was there anything to be concerned about?

MR. HARRIS: No, there was nothing.

THE CHAIRMAN: I had a call from a lady saying that the squirrels in her area were losing their fur because of the bomb dropping in Nevada.

MR. HARRIS: Unfortunately these things do happen, and we have to be in a position to explain it.

THE CHAIRMAN: You have heard things such as that?

MR. HARRIS: Gosh, we have heard ---

THE CHAIRMAN: In other words, people blame so many events on it without any basis.

MR. HARRIS: We have taken extremely high measurements in Rochester. Once we had a



measurement as high as a million disintegrations per minute, - a million radium decays per minute per square foot. This is a lot of radio-activity, but three days later there was nothing.

THE CHAIRMAN: How do you arrange these stations?

MR. HARRIS: Well, it depends. In the United States they are handled by the Weather Bureau.

THE CHAIRMAN: I mean, is there an overall Energy Committee throughout the World?

MR. HARRIS: There is now.

THE CHAIRMAN: Whereby they will permit you to put them up? In France, for example?

MR. HARRIS: There is now. There was not. Previous to that we did this by rather surreptitious arrangements. We had arrangements with our friends. In other words, we were able to place stations at places where our friends were. People that we knew were taking samples for us.

THE CHAIRMAN: Nothing official?

MR. HARRIS: Later it was official. The Government welcomed this kind of thing and gave us an interchange of information.

THE CHAIRMAN: I do not think that is



generally known to the public, I did not know it before.

MR. HARRIS: Well, I hope I am not talking out of turn. This is all perfectly above-board now. The United Nations Scientific Committee on the effects of atomic energy which is now meeting has assembled, I guess, 15 or 18 nations, and these people will see to it that it is done officially throughout the World.

MR. MACAULAY, Q.C.: Mr. Harris, I have two questions, but if you do not want to discuss the subject, just say so; I do not know that anything turns on it.

I read recently in a Canadian newspaper that out of 70 scientists, about 54 were supporting Stevenson's contention, and 14 were supporting Eisenhower. The number does not matter. But apparently there are scientists in the continental United States who are maintaining something. Now what is the "something" that they are maintaining.

MR. HARRIS: It is a rather vague "something". I must confess in the beginning that I am a Democrat, and I believe very strongly in most of the principles of Adlai Stevenson, but I





think he is "beating a dead horse" with this one. He has got something which makes political fodder, but really does not make much sense.

THE CHAIRMAN: I think probably the President would like to see you at that meeting tomorrow night.

MR. HARRIS: To answer directly to the question.

There are those who say that any radiation that the body gets is apt to be damaging. We do not know. This is the best point that they can make.

MR. MACAULAY, Q.C.: And they are saying it because they do not know.

MR. HARRIS: That is right, and they are saying they do not know. They say, "We do not know, but we think that any radiation may be damaging"; and this is the only point that they can, in justice, make. I was pointing out to my wife this morning that this is something that the Republicans "muffed", because the dozen people who supported the President are really top people. If you read through the list you will see there is the head of this and the head of that and the head of something else, - all in very responsible



positions, whereas the 51 or 52 or whatever it is are merely people working at laboratories, and really have no stature specifically in the field.

So I think that the Administration "muffed" this very badly.

MR. MACAULAY, Q.C.: Of course it is a negative kind of an argument. It is like the question, "When are you going to stop beating your wife"?

If you can say that the atom does cause something, that is the kind of thing that people might be interested in. However, I understand now what you say.

The other question I had in my mind was this: what was the measurement of the strontium, for example, in the centre or the eye of this thing? I know it does not matter to this argument. You were talking about 50 miles out.

MR. HARRIS: All I can say in answer to that is that nobody that is within 50 miles - and I am talking about the little one now, I am not talking about the so-called super weapon, the hydrogen weapon ---

MR. MACAULAY, Q.C.: Are they nothing more



than a bigger weapon and a greater concentration, basically, or is there a different formula of fission?

MR. HARRIS: I am not sure how unclassified that is. But we certainly get more in the nature of fission products from super weapons.

MR. MACAULAY, Q.C.: Assuming the weapon to be 15 times or 20 times what is shown on the board, how far out would you have to have the equivalent of the 50 mile radius that you show on the 200,000?

MR. HARRIS: It varies as the inverse square of the distance. In other words, if you have 10 times the effect it will show up to the square root of 10 further away.

THE CHAIRMAN: In other words it would be 15 times worse? Is that not what you are talking about?

MR. HARRIS: No, it would be 3 times worse in terms of distance, because it is a circle, it is all the way around.

MR. MACAULAY, Q.C.: Is not a man's approach to this somewhat affected by his psychological, philosophical, and religious approach towards



living as a whole?

MR. HARRIS: Even worse than that, it may be that his approach is in the direction which he thinks will do him some good.

MR. MACAULAY, Q.C.: So the mere fact that he happens to be a man of great repute, and he so argues, and if you separate these things and try to come to a scientific conclusion, you might find that much of his thinking was directed, perhaps, by his religion, coupled with his scientific knowledge.

MR. HARRIS: There are many things which mitigate this statement.

MR. MACAULAY, Q.C.: But impossible to explain to the public?

MR. HARRIS: Yes.

DR. EVIS, (Secretary): One doctor says that maybe the tolerance levels are not low enough.

MR. HARRIS: By the way, he was one of the 12 who supported the President. He is a very, very honest and knowledgeable scientist and he said there was much truth, but also much conjecture in the statement.

THE CHAIRMAN: In other words, you can take both sides of the whole situation.





MR. HARRIS: Certainly you can take either side. Anybody with an axe to grind can take either side in this and get all kinds of people to support him.

MR. MACAULAY, Q.C.: But the really conclusive available evidence, - the available evidence is not conclusive, but what evidence you do have rather more bears out the 12 men than the others.

MR. HARRIS: Oh yes.

MR. MACAULAY, Q.C.: Is that not the essence of it?

MR. HARRIS: Absolutely.

DR. EVIS: <sup>(Secretary)</sup> Did I get this down correctly, that bombs totalling 250 megatons would reach the crucial stage; that strontium 90 goes up 100,000 feet in the stratosphere and circles the earth for 16 years, with a 20 percent fall-out; that the air force officers have recorded 20 megatons as a normal bomb? Is that right? And that they are talking of testing 50 megaton bombs?

MR. HARRIS: We think this is wrong. So far there have been about 100 megatons exploded, as far as we can tell, that is by the Russians and ourselves, and we think that these can be increased by a thousandfold.



THE CHAIRMAN: Without too many ill effects?

MR. HARRIS: Without any ill effects, still being within the permissible amount.

(Secretary)  
DR. EVIS: Ten years after the first explosion the effect of that one is pretty well wiped out?

MR. HARRIS: Pretty well wiped out.

Let me tell you what we are doing. I think this might be interesting to you. We are measuring straight fall-out. That is our general sampling procedure, for many reasons. Mostly because it is very simple to put a piece of fly paper out and expose it to the elements and let what will fall on it, and then analyze what it is. In other words, we simulate a square foot of soil and say, over a period of 24 hours, this will have on it this much material. That is the basic measurement, - the so-called sticky paper or fly paper measurement.

We are also, in specified areas, taking such measurements and correlating them with the total quantity of strontium in the soil. In other words, we take the top one, three and six inches of soil in, say, a ten acre field on



which we have put this sticky paper, and we correlate the amount of strontium which is residual in the soil with the amount that falls out on the sticky paper. We are measuring the amount that is on and gets into vegetation.

In other words, we take vegetation from the surface and wash it out to see what has stuck to the surface, and measure the whole thing to see what has been drawn out through the roots. We measure milk from cows which have grazed on this field, and we slaughter young animals and measure the amounts which are in the bones of these animals. So that we try to get a complete ecological picture of the strontium and relate it to the number of curies per square mile which have fallen out.

MR. MACAULLAY, Q.C.: You are not able to evaluate the amount in the bone through the inheritance process? You could not separate it?

MR. HARRIS: That is not a problem. This is not something which is inherited. The genes are inherited.

MR. MACAULLAY, Q.C. I was going to ask you





do you call it "mutation" when a child is still-born?

MR. HARRIS: It is the result of mutation.

MR. MACAULAY, Q.C.: Is that the only result? It is not, is it?

MR. HARRIS: No, but this, by and large, is the result. In other words, what the geneticists say is that most adverse mutations are lethal; they will not permit be born.

MR. MACAULAY, Q.C.: I do not suppose there is any way of evaluating the bone structure of the second generation animal whose parent has been exposed, to estimate how that differs from the bones that might have been had the parent not been affected.

MR. HARRIS: Bones are not any more important than the blood or tissue.

MR. MACAULAY, Q.C.: Well, all right. I just took that as an example. There is no way of assessing that, is there?

MR. HARRIS: No. There is no way of checking the mutation rate, except that it has been done with small creatures; that is, it has



been done mostly with fruit flys, these little banana flys, because you get lots of generations quickly.

It has been done with vegetation. Of course this is one of the great benefits of atomic energy, - the fact that we can do this. We can irradiate a large basket of corn and create this condition and pick out the good ones, because mutations are as apt to be good as bad. A population which is evolving will survive, those which are bad will die out.

So, if you were to take an infinite number of mutations you would find that the good ones are largely represented by what we have, whereas the bad ones are largely represented by what we do not have.

MR. MACAULEY: Would they reproduce themselves too?

MR. HARRIS: Yes, that is why man exists.

(Secretary)  
DR. EVIS: That is why people are getting taller?

MR. HARRIS: Men would not be men if it were not for mutations. The geneticists do not think in terms of evolution as being a gradual



thing; they think of it as an affair of giant steps, each of which was the result of a mutation.

That is why today most mutations are lethal, because the good ones, we have had them all, - not all of them, but a large number of them.

DR. EVIS, (Secretary): If the next generation happens to be somewhat more intelligent than ours, because of mutations caused by radiation, we could not recognize it. We would say that the schools are better, or that they are taking more vitamins, or a thousand other things, though we could be improving because of radiation.

MR. HARRIS: Oh yes. There has been a big and specific program to improve our knowledge of these things.

THE CHAIRMAN: Mr. Harris, could we now sort of tie this thing in with air pollution?

MR. HARRIS: I would like to get off fall-out.

THE CHAIRMAN: Just before you go on, if you could just specifically advise us if there is any need to consider this whole program in a program of air pollution at the present time, or



not. I think that is the thing.

MR. HARRIS: My feeling on this is, that being a humanitarian I would like to see the world in such a state that there were no more explosions and no more atomic weapons; because what I was about to say in answer to the question, "What happens any closer?", is that if you are any closer you are in bad shape, because the atomic weapon is extremely, unbelievably destructive. It is destructive from blasts, it is destructive from fire, and let us say, destructive from variation.

The amount of destruction you get from a big weapon is really unbelievable. I would like to see us live in a World where we could throw them away, but as long as we live in a World where we cannot throw them away, I think we have to work on improving arsenal as much as possible, and as long as we do it we are going to test weapons and there is going to be fall-out; and the more informed that everybody in the public, especially at your level, is, the less cause for concern there will be.

I can assure you that there will be adequate controls, whether it be the United Nations





or the responsible nations themselves, to see to it that there is no danger to the world from fall-out.

Does that answer your question?

THE CHAIRMAN: Yes. So in a local air pollution plan -----

MR. MACAULAY, Q.C.: ...there is no room for it; but it is important to be educated on the subject.

MR. HARRIS: It is very important to be educated in the whole picture of what happens on radiation.

There is one area in which one kind of material, this fall-out material, can impinge upon air pollution from atomic energy activity, and that is that the measurement of this material can show a spot-eye reading and this can confuse other measurements. So if you have - I am thinking in the future - a power reactor running in one of your communities, and somebody suddenly screams, "I took a measurement and I found 1/10th of an m.r. per hour, or 1 m.r. per hour on the ground", the thing to do is to take a measurement the following day, and if it is gone, then you know it was fall-out from weapon testing. If it persists, then you know you have a problem.



THE CHAIRMAN: That is very simple.

MR. HARRIS: I think it is very useful to know if you can get eye readings, I mean measurable on a meter, from fall-out.

(Secretary)

DR. EVIS: About the atomic power plants. As you know, they have started one in England. There is one being built in Northern Ontario.

Can you verify that the operation of an atomic energy power plant would have no affect on the population? I mean, properly operated it should not cause any irritation, should it?

MR. HARRIS: Oh no. There is no irritation from a power plant.

(Secretary)

DR. EVIS: There would not be any fall-out, nothing would come up the stack and fall-out, or anything like that?

MR. HARRIS: Let me talk of that all in one picture, because it is not quite that simple. There are different types of reactor and things that could happen to it. Would you prefer that I talk about power before I talk of industrial uses for power?

THE CHAIRMAN: Do it your way.

MR. HARRIS: I thought that the indus-



trial uses for power would really be of great interest to you, because they are much more likely to come about. Whereas the power uses are something for which you can plan away ahead.

The possible industrial uses other than power are the use of radiation sources which are in capsulated gamma radiation emitters in place of x-ray machines. One of the types of radiation that is given off by a radio-active machine is gamma radiation, which is indistinguishable from x-rays. This is used because it is compact and inexpensive. It is possible today to get cobalt sources which have very high activity in them in just little bits, which will do a very good job of x-ray. These are used for x-raying pipelines, wells in gas pipelines and fuel pipelines. They are used for x-raying testing wherever industrially you want to get a picture of what the structure of metal is on the inside. You can use this kind of thing, or an x-ray machine. This is an industrial use which is going to increase. It is exactly the same as you do in the hospital with an x-ray machine, except that it is generally at a higher power level, because you get a lot more





dense material. This has no air pollution influence whatever. This is a sealed source, it is all tied up in a package and will not cause any air pollution. This is a direct radiation.

Generally, such sources are kept in a very effective shield; they are kept in a lead enclosure. However, they may not be. But in any event this is direct radiation; it is like light, and it will go through things, but not very far. So you have for this kind of thing a direct radiation source.

The second use is the use of isotopes. Isotopes will be used industrially and in research. To date they are used largely in research. What this means is that we have a chemical substance which chemically is indistinguishable from a substance which we normally use, but in addition it has the property of being radio-active, so that it can be traced and it can be measured with instruments. This becomes an extremely valuable chemical tool; that is, it is useful in all kinds of research.

I will give you an example of industrial research. They use it for measuring the lubricating quality of oil. The way they do it



is, either a plate on the surface of a bearing, a radio-active isotope, or sometimes to irradiate the bearing in a nuclear reactor. Anyway, the surface of the bearing has on it some radio-active material, and they assemble an engine with this radio-active material on the bearing, and they put lubricating oil in and run the engine for 10 minutes or more, pull out a sample of the oil, and measure how much wear there has been on the bearing by measuring the concentration of radio-active material in the oil. Then they put another oil in, and take another measurement, and they get a comparison of one oil with another.

They have never been able before to measure the comparison between one oil and another in an automobile engine, because what they used to do was to run it for six months, take it down, mark all the dimensions of the bearing, and put it back together again, and when they put it back again they did not have the same engine. This kind of thing will become very important.

In general, this kind of thing is not the creator of great amounts of air pollution,



but in certain circumstances it can be; and what we invariably require, where quantities of radio-active materials are handled that are above, say, one millicurie in amount, is that there be ventilation provided to protect the people and that immediately at the source of the ventilator there be a filter.

To give you an idea of what that means, this is a bench on which radiation materials are handled, and this is the person handling them. We ventilate so that air moves in this way across, and then somewhere in here (lower) we put the filter. The reason we do this is to keep the radio-active material out of the pipeline so that it does not radiate down on people. This is something that is easy enough to do, not terribly expensive in most cases, and is quite necessary so that the amount of radio-active material discharged in the air is the minimum.

MR. MACAULAY, Q.C.: Is that controlled by your Atomic Energy Commission?

MR. HARRIS: Yes, to some measure it is. However, we are getting out of it.

MR. MACAULAY, Q.C.: By whom is that regulatory application handled?



MR. HARRIS: At the present time by our Division of Civilian Applications. However, we are as rapidly as possible attempting to put this into the States.

DR. EVIS: <sup>(Secretary)</sup> The Department of Labour, or something like that.

MR. MACAULAY, Q.C. Do you know how it is dealt with in our Country?

MR. HARRIS: I do not have any idea.

DR. EVIS: <sup>(Secretary)</sup> So eventually it would get down to the local air control division of a particular municipality.

MR. HARRIS: It might in the larger cities. In New York it might. The Department of Health is the ideal way of doing it. Other people would go to some book like this. This is the 1952 hand book of the United States National Bureau of Standards. There is hand book 61, which is also written by the National Bureau of Standards which has a model code for the handling of radio-active materials.

In here is listed the amount of material which is permitted in the air; that means the amount of material which a person might breathe throughout his lifetime, and the assumption is that when the





material is discharged from such a device that it will be discharged at a given rate over a certain number of hours per week.

We generally attempt to arrive at the maximum concentration at a place where a person will breathe it, which is not more than 10 percent of the value which is in here. This is what we strive for. We do not measure it in the stack, but we put the 10 percent value on it at the ground. In other words, where somebody is apt to breathe it, and we consider this in terms of 168 hours a week of breathing.

Another thing which may concern you people is stream pollution. This is also a problem. In other words, this stuff has to be thrown away some how or other. It has to get into streams which may, in turn, get into drinking water sources; and the usual sewage disposal plant will take out only a relatively small fraction of this stuff, and some will get into the streams; and again, figures are given in here for the amount which may be permitted in a stream.

This can be taken care of again by filters, if it is solid, and precipitation if it is not.



Both of these things are important, and both must be dealt with separately.

Recently, self-imposed regulations that the contractors of the Commission have accepted have been that they not exceed this value in their effluent.

MR. MACAULAY, Q.C.: Do you have many codes in relation to water pollution?

MR. HARRIS: Well, it is in here. You mean, do the States have?

MR. MACAULAY, Q.C.: I think you referred to another pamphlet, No. 61, which is a model code, but only for industrial use in the air and working around, and so on.

MR. HARRIS: No, that also has environmental application.

MR. MACAULAY, Q.C.: Including streams and so on? Could we get a copy of that pamphlet before we go?

MR. HARRIS: Sure. I will give you three things. I will give you 52, 61 and the A.E.C. part 20, which is the Federal code which has not yet accepted, but which is our best effort to interpret these things for our licensees.

During the interim period, until the



States are in a position to take it over entirely, we are going to have to supervise a good deal of this, because only a few of our States have adequate regulation and enforcement agencies.

I think there are about five States in the Country which are in a position to do anything about it.

THE CHAIRMAN: I think that is an important development, - the fact that the Federal jurisdiction is turning the supervision of the radio-active program over to the States. Is that not just what you are doing?

MR. HARRIS: Yes.

THE CHAIRMAN: Why?

MR. HARRIS: Well, traditionally that is their responsibility. The States have always had the responsibility for the protection of the people within the States, and it was only that we were dealing with a sort of an unknown factor and an unknown problem that the Commission has accepted any responsibility in this.

DR. EVIS: <sup>(Secretary)</sup> And as soon as you can pass it on to the States, the better you will like it?

MR. HARRIS: We do not want to be responsible for this kind of thing. We will



retain some functions.

It is a very complex thing, and what it is going to be five years from now I am afraid to predict, but I can tell you that at the present time we are requiring everybody who has either source material, by-product material, or fissionable material to be licensed. They carry a license which says, "we are going to do so-and-so with so much of such-and-such a material"; and as part of this license business we have set up an inspection procedure whereby these people will be inspected on a periodic basis, and the entire operation evaluated, primarily for health and safety.

The way our inspection division is working at the present time is that, if possible, they have somebody from the States accompany them on every inspection they go out on; and they are doing this for just this reason.

THE CHAIRMAN: I think it is reasonable to assume that the same thing would probably happen at home, because the main purpose for dealing with the whole subject is the health of the people, and that is the responsibility of Provincial governments.





MR. HARRIS: That is right. Of course our Atomic Energy Act specifically places the responsibility on the Atomic Energy Commission to see to it that nothing with which it is connected in any way adversely affects the health and safety of the public. So there is a responsibility set up.

This is a very unusual thing, but this is a responsibility set up by the Congress on the Federal Agency.

THE CHAIRMAN: You could hardly leave it to the States when they did not know what it was all about.

MR. HARRIS: That is right.

THE CHAIRMAN: In the initial stage.

MR. HARRIS: That is right.

MR. BELYEA: The municipality or the State probably knows almost all the locations where radio-active material is handled, but there may be a few unauthorized persons handling it without their knowledge, and material escaping. Is it reasonable to try to locate those by surveys around the city?

MR. HARRIS: No. It is almost impossible. You have to get the cooperation of the



individual.

MR. BELYEA: Some people have been known to take the material home and experiment with it and get into trouble.

MR. HARRIS: You would never find it. Unfortunately, the background is so high and variable that you would never be able to pick out the unauthorized source. Unless it were gamma radiation it would be utterly impossible. With gamma radiation it is conceivable, but it would have to be a pretty husky source, and you would have to hurt some people before you could find it out.

MR. BELYEA: Is the United States Public Service or any other body making measurements of air pollution generally?

MR. HARRIS: Yes. Every jurisdiction that has an atmospheric pollution responsibility is making such measurements, or at least is taking such samples.

MR. BELYEA: Some are taking high volume samples and then measuring them?

MR. HARRIS: Yes. Either measuring, or sending the samples into Cincinnati where they are being measured.



MR. BELYEA: Would you suggest we do that when we take our high volume samples?

MR. HARRIS: Measure them for radio-activity?

MR. BELYEA: Yes.

MR. HARRIS: Only as a scientist.

MR. BELYEA: To keep a record for the future?

MR. HARRIS: It is useful to know what happens. I do not think you will find anything. I think occasionally you will run into a very high sample which will persist for a day, possibly two days, and then be gone.

If you measure it against the background it would go up a million or ten millionfold above the background.

MR. BELYEA: If we took the high volume sample we could keep it for a year and measure it.

MR. HARRIS: You could, yes. You could measure it periodically. This is certainly a very feasible project, we used to do it a great deal.

We used to have every one of these stations equipped with two high volume samplers, but we found that the amount of inhaler activity and potential danger from it was very much lower than the potential danger from the direct radiation in a fall-out situation. It is lower by a



factor of 1,000 or close to that.

DR. EVIS: <sup>(Secretary)</sup> I have one last question, as far as I am concerned, and that is the effect of the explosions on the weather. Would you care to comment?

MR. HARRIS: I cannot answer that question. I have heard no general answer to that. But it is inconceivable to any responsible physicist or meteorologist that the amount of force or energy which is generated in an atomic explosion could in any way affect the general weather pattern. It is inconceivable because the energy in an explosion is no way near the amount of energy which is in a relatively small local storm.

DR. EVIS: <sup>(Secretary)</sup> What about the accumulated amount of strontium 90?

MR. HARRIS: It is not an accumulated amount, it is a mixed fission. In other words, it is the total activity. The strontium is only important in the body.

The total concentration in any volumes of atmosphere is really awfully small. The highest measurement we took was 110,000 feet, but we have taken measurements essentially from ground level up to about 100,000 feet. We can measure this





stuff. Believe me, we have to be awfully good to do it. We sampled it at the rate of 1,000 cubic feet a minute, running for eight hours, and we brought the thing down and scraped and scraped it out, and we got measureable amounts of radio-activity, but it was of an order of two, or three, or five disintegrations per minute in the whole batch of air that we sampled, - which means that these radio-active particles are one here, and one 500 feet away, and one over there; they are awfully thin.

To get back to your question, whether or not this has any conceivable effect on our meteorology is something I am not prepared to judge. It is inconceivable to me that it could, but very strange things do happen, and it has been postulated that where the ionization at ground level is higher, it could create local conditions, multiplying them.

In other words, a very small disturbance could be built up to a larger, and larger disturbance. So I will not say "no", I will merely say it is very unlikely and I cannot conceive, neither has anyone else conceived, of a mechanism by which this could happen. I do not



think it happens. I certainly would not say it does not.

I have very briefly touched on the industrial uses of isotopes. A much more important industrial use, which may very well come within your jurisdiction, is the recovery of material from the ground and the fabrication of that material to a reactor fuel; the whole chain of events which goes with the mining, the milling, the refining of uranium and thorium and the fabrication of the uranium into useable fuel.

Do you have any uranium mining at all in Canada?

DR. EVIS, (Secretary): Yes.

MR. HARRIS: So all of these things may eventually come within your province.

Here in the mining operation there are problems not of external but of internal air pollution. In other words, you have got a lot of radioactive material in the mines, and this is a really serious problem which we do not know how to lick. I do not think you people are particularly interested in the industrial ----

MR. MACAULAY, Q.C.: Yes, we are.

MR. HARRIS: The big problem of radon



gas-----

MR. MACAULAY, Q.C.: Inside the mine?

MR. HARRIS: Yes. Uranium, when it decays, when it comes off one of these radio-active particles, jumps down the scale to another chemical element, and this, in turn, gives off a radio-active particle.

There is a degradation all the way down until we finally reach stable material, but it is not until you get down to lead that uranium becomes stable.

In this chain it passes through radium - this is where we get our radium - and the next step is radon. Although it is similar to such gases as neon and clypton, it is different in that it is radio-active. When the gas is formed in rock it does not stay there, it oozes out and any place where uranium is mined there is also radon.

Let me say further that practically every underground operation which is carried on in the World, with very few exceptions - and the exceptions are only in unusual materials - exists only with a significantly elevated concentration of radon, elevated by something



of the order of 100. It is measurable; in other words you can find it everywhere. The amount of radon which is present in the usual metal mine, that is the uranium metal mine, lies somewhere between the two values which have been chosen as the permissible level.

The one which is given in here, and the one which the Public Health Services in this Country use, are different by a factor of ten. This one has a certain number of curies per meter, and the one that the Public Service has always used has another number, - ten times more.

Between the value given in here and the value which is normally used lies practically every metal mine that is worked, and there is nothing they can do about it, because the classic way of getting rid of contamination in a mine is with a ventilator, but unfortunately when you ventilate for radon you must draw your air down through your working courses here on this rock which is giving radon up, and by the time you get to where men are supposed to breathe it, it has already become as saturated as the air which was there in the beginning. To ventilate with.





outside air directly taken to the point of working is extremely expensive.

I am mentioning this as a problem.

We do not know whether the value which is stated in here or the value which is generally used is more acceptable, but I have a tendency to believe in the value which is generally used, which is 100 micro-microcuries meter of radon, possibly only because I am used to it. It is the value I used back in 1935 and 1936. But we are uncertain, and we are trying to find an answer.

If it turns out that people get sick from the amount of radon which we have got, the cost of uranium is going up, because the cost of mining is going to be much greater.

We went to South Africa, and in Johannesburg we found that the concentrations of radon in the gold mines were of the order of two or three times the permissible level which we use, which is 20 or 30 times what is in here, and yet we could find among the population we were able to look at, in other words what medical statistics they had, no affect whatsoever. So we feel a little bit easier in our minds.

MR. MACAULAY, Q.C.: How does the con-



centration compare in a uranium mine with these gold mines?

MR. HARRIS: It is higher by about tenfold.

MR. MACAULAY, Q.C.: Ten times as much, and the concentrations in the gold mines, I think you said, were about three times higher than what was considered to be a permissible level?

MR. HARRIS: Generally up to about that.

With good working facilities, it is possible to bring what you would normally find in a uranium mine down to the permissible level. I say it is possible, but it is very difficult.

MR. MACAULAY, Q.C.: The air would have to be brought in tubes of some kind, would it not?

MR. HARRIS: Either that, or be brought in so damn fast, yes, that is the way to do it, in duct work. Carry it in. That is the best way we know of.

MR. MACAULAY, Q.C.: And then get it out again?

MR. HARRIS: Getting it out is generally easy. It is getting it in which is hard.



So far, in mines that we know of, - - that is in the mines that we have discovered so far, - - there is no other radio-active hazard.

MR. MACAULAY, Q.C.: Does air have some power of absorption up to a certain limit, a saturation point?

MR. HARRIS: You can have pure radon, any dilution at all. If radon were here it would decay. It decays very rapidly. It has a four day half-load. On other words, at the end of the week any radon you have is gone.

MR. MACAULAY, Q.C.: You say, four day half-load?

MR. HARRIS: Half of the material is completely decayed in four days, and in the next four days it is another half, and so on.

MR. MACAULAY, Q.C.: It is not injurious to the skin or anything of that nature? It is just an assimilation through the capillary action of the lungs?

MR. HARRIS: Well, it is a bombardment of the lung tissue by the particles that are generated in the decay. But this is the only problem. It does not exist outside.



That is, it is not an atmospheric pollution problem, but it is a potential danger to the workers.

In the concentrating mills there is a certain amount of sulphur, both from general atmospheric pollution and from exposure of workers. This is generally at the concentrate end. That is, they start with a very low grade material, 10%, and concentrate up to maybe 80% of uranium.

We have a figure in the book which we try to stick to for the permissible concentration of uranium in the air. I may say that we have exceeded this in some of our plants by many, many fold for considerable periods of time, and so far have seen no case of any type of illness among our workers. But we still-----

MR. MACAULAY, Q.C.: It may be awfully early when you think of these women.

MR. HARRIS: Yes, it may be early. I must admit we are still very cagey about it, and we play very close to the chest; but we have men exposed from about 1945 to 1950 to concentrations which exceeded our permissible level by probably a thousandfold on the average,





and so far we have seen no ill effect.

MR. MACAULAY, Q.C.: It may be like the straw that breaks the camel's back. You may think you are safe at one level, but you may not have to go very much over to tip the whole canoe.

MR. HARRIS: This is possible but it has not been reflected in the experience with radium. But as I say, we are playing this very carefully, and we do stick to our levels.

Today I think we have about 5,000 people engaged in this operation, and maybe more than that.

MR. MACAULAY, Q.C.: And you are keeping track of them too?

MR. HARRIS: We are keeping track of them, very careful track of them, and none of them are over-exposed in the Commission-operated plants.

Within the mills, which we do not have complete control of, there are over-exposures; that is, beyond these levels.

MR. MACAULAY, Q.C.: What do you mean, you do not have control of them?

MR. HARRIS: The position the



Commission has taken is that they will buy concentrate, and however you may make it is up to you. This is the position, and it may be a bad one, but it is the one the Commission has taken.

The Public Health Service is doing all of the guiding and the controlling in the local areas.

MR. MACAULAY, Q.C.: In short, you cannot have concentrate and not have concentrate at the same time, and you cannot be prepared to buy it and at the same time say you cannot have it because of health reasons?

MR. HARRIS: That is right.

THE CHAIRMAN: Of course, although you do not directly supervise this, you are working with the Federal Health Department.

MR. HARRIS: That is right. We are also working with the millers. We hope within the next six months to be able to publish a complete study of all the mills, which means we would have to go to every mill and survey it, and what exists there, and make recommendations to the people for improvement.

When I say we have not any



control there, that is not that we are not exercising a certain amount. We do not have any legal control.

The areas in which this is done are apt to have some air pollution beyond radioactive materials, and this must be watched and covered; there has to be ventilation and the ventilating air has to be moved. They are generally not reluctant to do this, because the material is valuable. They get paid something like \$10.00 a pound for the uranium content; and as a result they are generally willing to put in whatever dust collector is necessary.

So it is not really a problem, but it is one that has to be supervised, and they have to be told, because they do not know how to measure it and they do not know what it means.

To get to the next step, which I would think is looking somewhat into the future for you people, this concentrated material is then refined, and this is done by taking the concentrate, it is dissolved and chemically processed, and finally put through a metallurgical process where the final product is



uranium as a metal.

Possibly some day you will also be thinking in terms of uranium hexafluoride, because when uranium 232 isotope is separated from uranium 235 it is more valuable in reactive work. This again is working in a province where the economics almost force the plant to be under good control.

We have seen a lot of local pollution, and when I say "a lot" we do not have it in many places but you generally have to discharge a tremendous amount of uranium, either into the air or into the water before any local hazard exists. By "tremendous amounts" I mean tremendous monetary amounts, so that the control there would be largely economic, and I think will only require a certain amount of supervision by you people.

The next step beyond this is the final use of the uranium as a fuel for the reactors. What this means is that a certain quantity of uranium 235 metal is made into a gadget. This is a section of the fuel element. The black stuff is uranium; the lighter covered material is the aluminum jacket (the speaker exhibits a small tubular case and contents).





The reason for the aluminum jacket is to isolate the uranium from the air, because uranium will oxidize rapidly, and also to keep within the uranium the fission products that are general during the reaction.

This is permitted to burn within the reactor. The uranium fissions in there and gives off heat. At the end of a period of time it is withdrawn.

Several different kinds of reactors are produced. The one which is apt to create - which can create general air pollution is the air-cooled reactor of which Book Hagen is an example, and I believe the British reactors are going to be air-cooled reactors.

The reason that an air-cooled reactor is potentially productive of pollution is that the fuel elements are occasionally recaptured; that is the aluminium jacket, when it does capture it does not have to recapture very much - a tiny pinhole is enough - fission products get into the air stream and are discharged through the stack.

MR. MACAULAY, Q.C.: Is that what happened at Chalk River?



MR. HARRIS: No, what happened at Chalk River was the water-cooled reactor -----

MR. MACAULAY, Q.C.: Something happened, they say, to close it down.

MR. HARRIS: What happened was that the water which surrounds these fuel elements was made radio-active because the fuel elements ruptured into the water, and the fission products got out; this was dumped into the sump below the reactor and they had a bunch of radio-active water which contaminated the whole thing. They had to get in and clean the debris out. It was a great problem and it took them months.

THE CHAIRMAN: So that the men would not be contaminated through remaining?

MR. HARRIS: That was the big problem, that is right. They had people on one-hour shifts. It was a very difficult thing to do, and a rupture on a reactor is a terrific problem.

THE CHAIRMAN: That is all that happened?

MR. HARRIS: That is all that happened.

THE CHAIRMAN: The casing ruptured and the stuff got down into the water and the sump, and



they had to clean it out?

MR. HARRIS: That is right.

MR. MACAULAY, Q.C.: Is that a common thing?

MR. HARRIS: No, it is very uncommon.

There have been, I think, three or four reactor incidents wherein that has happened. Two of them have been quite deliberate. They did not exactly know what was going to happen, but they tried their best to make it happen. I will give you an example. There was a borax reactor which they deliberately destroyed in alcohol. That also was a water-cooled reactor, and in order to get the thing to get out of hand they had, not to withdraw the control element, they had to eject the control element at a very high velocity. Generally the reactor is controlled by putting something in it which sucks up neutrons, and they first tried, by tying little bits up and down, to determine what happens in the event that something goes wrong.

They tried to withdraw this thing, the control rod, as fast as possible, and they found that they could withdraw it in a tenth of a second or one hundredth of a second and that was as fast as they could do it, and that would not do any



good, so they finally had to rig up a device which would eject this thing in less than one thousandth of a second before they could make the thing go. When this went off, it not only contaminated the water with fission products, but it raised the temperature of the water enough so that there was a steam ejection, and contaminated steam got into the atmosphere.

After this happened, or rather while this happened and during and after, they took measurements, and within about 50 yards of the reactor itself they found considerable amounts of radio-activity in the air. Beyond 50 yards they found nothing. It tapered off. So within 50 yards they had the total extent of the contamination.

What will happen in the future when a big power reactor - a 50,000 or 100,000 k.w. power reactor - somehow goes off is something that nobody knows. They attempt to prevent this with a whole series of interlocking controls. In the first place they attempt to design the reactor in such a way that it is self-limiting; in other words, as it starts to run away, to get out of hand, it quenches itself.





To give you an example of what this is, in order to be effective a reactor has to have this (illustrating). This is the core of the reactor, and this is the moderator, so-called, which is the surrounding atmosphere. This has to be confined within a certain density, a certain space. If it gets beyond this peak, it stops; in other words, if the surrounding atmosphere expands a little bit, it stops, or if the fuel elements themselves expand a little bit, they shut down. This is the kind of thing they have been designing into all of the so-called "boiling water" reactors, as it is a kind of built-in safety feature.

When steam is formed around the elements it automatically shuts off the reaction. In other words they try to design a reactor with what they call a negative temperature coefficient; that is, one which, as the temperature rises the radio-activity goes down. That is the first step.

The second step is to design controls which are automatic. That is, they have control rods which are geared to radiation density and to temperature density. As soon as the temperature goes up, the rods go in, or as soon as radiation



density goes up, the rods go in.

If the control rods do not act, and the level rises beyond a certain point, the thing is automatically flooded in such a way that the water is dumped out, or something like that happens, which shuts down the reactor. Not to reduce its activity, it actually shuts it down.

Then there is a fuse element in addition to this which, if the temperature should rise, this fuse automatically cuts them out. On every reactor which has been accepted so far they have something like 10 or 15 different things, each of which must fail, some of which are automatic and some of which are controlled by man, so that in the design of a reactor they attempt to build into it safety features which are away and beyond any safety features that have ever been designed.

So the chances of a reactor accident happening are one in a billion billion, because each step has to happen successively.

THE CHAIRMAN: In the event it went through the 15, what then?

MR. HARRIS: That is the next step.

In addition to that, they are building



them so that, should everything go wrong, and should they blow up, they will never blow up like a bomb, they will blow up like a steam explosion, or something like that.

Whatever destructive capacity they have has really no nuclear background, it is a physical background, because you cannot make a reactor explode, all you can make it do is make the temperature go up to the point where it melts the elements and destroys the internal components. But they design a gas type enclosure which is sufficiently strong so that, should everything happen, the pressure which is built up by the reactor is not sufficient to rupture the enclosure, whatever this enclosure may be.

In addition to that, they try to design so that, should everything fail, including the housing, it be planted in a location where there is some exclusion of people, and that whatever happens happens only to the people working in the unit itself, and that there are no people within a given distance.

This multiplicity of controls which is now required will undoubtedly be relaxed in the future. It will start going back, it will



eliminate the explosion area, possibly eliminate the housing and some of the safety devices; so that some day we are going to have a reactor accident. It will happen - it is bound to happen.

We still do not know what the effect of this is going to be, but we are studying it as hard as we can. But I am afraid that the only real study that can be done of such an accident, to define what happens, is to take one and make it happen deliberately, have people there to measure the accident and then we will know.

There are big high-powered study groups who are spending a lot of time on this, trying to define what is the area within which people are going to be hurt.

THE CHAIRMAN: Mr. Harris, we are due at New York University at two o'clock. Could we sort of wind this up.

MR. HARRIS: Unless you have some questions about the problems of reactor operations, I think I have about finished what I have to say.

THE CHAIRMAN: How would it be to save the questions for the lunch period? We will be running it pretty close. So if it is





all right with you we will just move out now and  
find a place close by.

- - - - -

- - - Whereupon the further proceedings of this  
Committee adjourned at 12:10 p.m. until this  
afternoon at 2 of the clock.

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A F T E R N O O N   S E S S I O N .

New York, N.Y.  
Wednesday, October 24, 1956.  
2:00 o'clock, p.m.

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The further proceedings of this  
Committee re-convened, pursuant to adjournment.

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PRESENT:

Mr. A.H. Cowling, Chairman,  
Presiding.

Hon. Mr. Kelly,

Messrs. Morningstar,

Elliott,

Murdoch,

Gordon,

Macaulay, Q.C.

Thomas (Oshawa)

Dr. F.A. Evis, Secretary.

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APPEARANCES:

Mr. Gordon Strom,      College of Engineering,  
New York University.



The following proceedings were held in the College of Engineering, New York University, West 77th Street, New York City.

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MR. STROM: This wind tunnel was started in 1948. It was designed from the beginning for the purpose of making skilled model studies of air pollution problems. Our work has gone generally in two directions. One is the actual studies of specific problems of a type that can be handled in the wind tunnel.

The other is a program of wind tunnel development, to understand the capabilities of the wind tunnel, and to handle more complicated problems, relating to air pollution.

We have here a model power plant. Problems of this type are primarily connected with the mechanical effects of the air stream.



By that I mean that the motion of the pollutant as it leaves the stack is determined primarily by the air currents caused by the presence of buildings and other obstructions.

One type which can be serviced through air streams which reproduce mechanical effects as opposed to thermal effects in the air stream, and these problems are primarily those of mechanical effects which involve pollution relatively close to the source, within a mile, identified with the specific plant, as opposed to the area type of problem which involves a number of sources and gets into other aspects.

A type of problem which we cannot handle in the wind tunnel presently is that which involves thermal effects, turbulence caused by the characteristics of the ground and air streams coming from other parts of the surrounding area. These properties we do not presently reproduce in the wind tunnel, although we are working on it in terms of wind tunnel development.

Therefore, we cannot deal with problems in which the thermal effects are predominant.

Where the effect of surrounding build-





ings is an important feature we can solve it, because these mechanical effects are more important than the thermal effects.

In a problem of this kind, as far as the air speed is concerned, all we are doing is controlling speed. We have a uniform air stream approaching the model. It may have turbulence due to buildings or other obstructions ahead of it; we can reproduce that in order to include such effects.

The air stream is only controlled in speed, and where we control direction we turn the model in two directions. We have, therefore, wind direction and speed.

We control the speed and the density of the ejected gas. Presently we do that by controlling the rate at which the air goes through it, and we have a heating element below the stack which heats up the gas as it enters the stack itself. Therefore, we stimulate the temperature or density property.

The reason the plume travels high is that there is nothing to make it go anywhere else. The buoyant properties which make it rise are due to heating. We control the ejecting



speed plus the density or temperature. We used to get our density by mixing helium with air, but helium is now in short supply.

We vary the various variables such as wind speed, ejection speed, etc., and observe whether the plume contacts the ground or any point of interest. Sometimes we supplement that with photographs to actually get a record of where the plume goes, and so on.

There is more dispersion when it is hot.

(Mr. Strom proceeded, with the aid of an assistant, to indicate with visual illustration the uses of the appliance).

MR. MORNINGSTAR: What are you supposed to be burning?

MR. STROM: Coal. Of course the smoke in our model is not supposed to look that way (indicating), but it is intended to give a visible indicator. So this does not represent the appearance of the plant.

One new technique we have established in the past here is to actually measure the concentrations of the gases. For that purpose we have this instrument (indicating), which measures



sulphur dioxide concentration. It is a type used in a lot of pollution studies.

With this instrument we can draw samples from the air anywhere in the region of the model and get the concentration of sulphur in the smoke.

In the supply of gas that goes into the model we insert sulphur dioxide. We have the data on the percentage of sulphur dioxide in the actual plant. We have the known amount. With the meter in our control system we know how much goes in the stack. We get a measurement which should start out at zero, increase the speed by increments, and in that way get the range of concentration as against wind speed.

We often hear about wind speeds favourable to pollution. They are favourable if they are high enough to be beyond the range of depressing the plume. But probably this type is usually rather high speed, maybe 30, 35, 40, 45 miles an hour, which speeds are so infrequent as to be unimportant. Radiations and concentrations under various test conditions can be combined with meteorological data to give a result which perhaps has more specific significance.



Later we can determine how many hours a year the wind from this direction is, say, between 20 and 25 miles, how many it is 30 and 35, and so on.

In that way we can combine the results to determine on how many days there are two parts per million of sulphur dioxide, and so on. So we come out with a realistic result which is a basis of judging various plant modifications.

We will then try various modifications and figure which are the more promising in terms of solution of the problem. But we actually try to get more than one solution. We may find that one solution is more economical than another. It may involve high ejection with a low stack, giving the same result as lower ejection with a higher stack. A high stack involves a higher initial investment. So sometimes you like to have a series of solutions and have some choice after a study of the economic factors involved.

Most jobs of this type involve primarily the modification of stacks. There is often a limitation as to how much you can do with the stack of an existing plant. We can increase them sometimes, but there may be limitation on the





basis of the structure of the plant. It sometimes is more economic to build a new stack apart from the old building. With an entirely new plant you have, of course, a much greater range of flexibility, and can contrive what may seem to be the most effective results without considering all the limitations there are in an existing structure.

Those are the types of problems we are presently studying in the wind stream. As I say we do not have on a working basis any control of thermal properties. I do not think they are significant for this type of problem.

Where wind speeds increase over, probably, five miles an hour, they cause so much mixing of the air that it tends to eliminate or minimize the thermal effects.

THE CHAIRMAN: Are your operations here available to industry?

MR. STROM: Yes.

THE CHAIRMAN: What do they pay? A fee?

MR. STROM: That is right, for the information we are able to give them.

THE CHAIRMAN: Are you kept pretty busy all the time?



MR. STROM: Yes.

THE CHAIRMAN: Tell us some of the organizations for which you have acted. Can you do that?

MR. STROM: Consolidated Edison Company of New York. We did one for the Rockland Power Company. We conducted one in Michigan for the City Power Plant.

This present one right here - I have the Doctor's permission to mention it - is being conducted for the Detroit Edison Company.

In most of these studies the plant people prefer that we do not publicize the material, for the reason that they do not want to decide which solution they want to put in the plant at this stage of development. They want to make a good selection for a solution.

MR. MURDOCH: This is a plant under construction?

MR. STROM: No, it is an old plant reconditioned.

It is a very complicated situation. Presently they do not appear to have a pollution problem, as it exists, but they are planning to increase the size of this plant to where it is



more than likely it will create a pollution problem. So it is a two-pronged affair. They want to improve the efficiency of the existing plant, but they are adding a new unit, and we want to test it not only for its own characteristics, the effect it may have on the old plant, but for any modifications that may minimize future difficulties.

THE CHAIRMAN: Mr. Murdoch is particularly interested in that because he comes from Windsor.

DR. EVIS: <sup>(Secretary)</sup> The pollution goes across the river from the States to Canada, and vice versa.

THE CHAIRMAN: It is good to see that these industries are really making an effort to do something about it.

When we were in Detroit, according to the air pollution people at Detroit, they were getting a lot of cooperation from the Detroit Edison Company. They had pretty well solved the problem. Now they are going to extend, and have come here for further advice, which is a hopeful indication.

MR. STROM: We have done work for the



Heppell Corporation, which is a chemical corporation. We have done work on three of their plants. This involves mainly new construction.

THE CHAIRMAN: Have you done anything with the Cyanamide Plant?

MR. STROM: No. We have tried to give several pollution answers. There is usually more than one way to improve a situation. Of course they are interested in the most economical way, so we attempt to find several that are feasible and then they can make an economic study from that point on.

We have done work for the Kaiser Aluminum Company in one of their air reduction plants.

THE CHAIRMAN: Do you know anything today of the Trail B.C. sulphur situation?

MR. STROM: No.

THE CHAIRMAN: Have you done anything for Canadians at all, or American plants with Canadian subsidiaries?

MR. STROM: No.

THE CHAIRMAN: Is there anything like this air tunnel elsewhere in the United States?

MR. STROM: The wind tunnel?





THE CHAIRMAN: Yes. This was the first?

MR. STROM: The first was in Michigan. It has done work over the years. But I think ours is the only work of this type which is on a continuing basis. There have been various individual projects in the Country over the years.

About ten years ago there was a job done in Baltimore. They had a small tunnel up there for aircraft work. The Bureau of Mines has done some work. I do not know whether they still have a tunnel or not.

A small job was done last year for the Washington Edison Company. That is all I know of. That was for a pollution problem.

THE CHAIRMAN: Do you find that the pollution from coal burning operations differs from the oil burning operation and the natural gas operation?

MR. STROM: Well, we are not involved in the project itself. All that we are interested in is how it affects the problem. As far as we are concerned it is the density of the gas and the heat-free situation. Although I should point this out, that we are studying the gaseous problem.



I think this is the most serious problem. Removing the gases produced by the plant would be a very costly procedure. Usually it is not an economic process in terms of getting by-products. So from our viewpoint it is immaterial how the gases are created. Different sources create different kinds. If you use natural gas there is practically no sulphur in it. You would not have the sulphur contamination that you would have with coal.

MR. MURDOCH: I suppose sulphur is pretty hard on leaves?

MR. STROM: Yes. Now you are getting into a region in which there is a good deal of controversy. Some medical people take the view the air pollution is not a serious factor in health, except for people who have certain diseases of the lungs. So we are in an area where we have not enough information.

Certainly it must have some effect, and those affected, even to a small extent, must certainly be considered in that problem.

The effect of sulphur on vegetation is an interesting point. Certainly vegetation is damaged by certain amounts of dioxide, but I heard



a comment recently from someone from Los Angeles to the effect that some people now believe that the sulphur problem out there is not a problem in that respect. Some may think that culture may actually benefit from sulphur where there is an insufficient amount of sulphur in the soil.

In the past sulphur has been the main ingredient in most pollution problems, but that may be because they had not time to investigate; and they have since got much more accurate information.

DR. EVIS: <sup>(Secretary)</sup> Is that photo-flash for taking pictures of the plume?

MR. STROM: Yes. We have inside the container about six electronic flash bulbs, and if we want to take a picture of a plume we usually set up three cameras, which are synchronized. We take three photographs simultaneously with the flash with stops equivalent to 1/5000th of a second exposure, and make a composite picture on the screen. That is to give more of a field for analysis of problems.

The important data is numerical, but seeing some of the photographs is helpful to visualize the problem a little. Movies are very



effective. We have taken stereoscopic slides to give a three-dimensional aspect to some who have not seen it.

DR. EVIS: <sup>(Secretary)</sup> Can you show us the affect on other buildings by rotating the table?

MR. STROM: It is difficult. We do at various stages on this model make a survey of various directions; we make our various studies of the critical direction, and when we think we have our solution we go and check them again for directions. We can give you some other affects.

Here is a composite of two photographs to show you what some of these look like.

DR. EVIS: <sup>(Secretary)</sup> It would be interesting to see your sampler work on the air stream.

MR. STROM: It is such a low concentration you can hardly get a reading.

I want to mention briefly about the way we set the speeds here. In order that we have the features of the plume, the direction of the path of the plume, and the correct geometric shape in relation to the model - in other words that we have a true miniature version in all respects - we must set our speeds in accordance with certain scale factors or similarity laws, and for that





type of phenomenon in which are involved gases of different densities - air one density, gas another density - we must scale our speed downward in proportion to the square root of the linear scale. This is on a scale of one inch to twenty-five feet. It is about one to three hundred. The square root of that ratio is about one to nineteen. So that one mile per hour in the wind tunnel reproduces what happens at nineteen miles per hour out of doors. Half a mile an hour here would be half that, so we must scale these speeds down in proportion in order that the reaction of these various forces - buoyancy and wind and so on - will be scaled down in correct fashion.

That means that our speeds here are very low. We are testing around one and two miles an hour; and this is a very difficult speed - to get low speeds with a useful air stream is difficult if you go below five miles per hour. After we had tried this and were reasonably successful, we had a report in which the author makes the clear-cut statement, "Do not test below five miles an hour". He had that experience, but did not go into the extensive development we did to do it.

What happens at these very low speeds



is that the air moves so slowly that the parts in contact with the various ducts of one test area are affected by local temperatures. One side is cooler than the rest of the air stream, and air that moves closer to it gets a little cooler, and it creates an air current and drops.

So at these low speeds, if you do not have the proper design for it, you have a very irregular stream of wind, not useful for this purpose.

That blank wall is part of a cubicle enclosure which is insulated all around - top, bottom and sides. The air that goes into the tunnel here first goes into that enclosure, and to get in the enclosure it goes through a set of heating units which are thermostatically controlled so that the air is heated up to the same temperature.

We have thermostatic control for hours at night, and we keep that temperature 24 hours a day to keep the various parts of the structure from taking different temperatures. So we go on rather an elaborate system just to get a useable air stream of one to two miles an hour.

To my knowledge there is no other tunnel that is equipped quite the way this is to



do that.

As part of the program we are trying to control thermal conditions which are significant to area problems, extensive turbulence in the night-time or daytime.

Mr. Strom proceeded to explain the structure of a machine, having the trade name of Pitrilog, that measures concentrations of oxidizable sulphur compounds.

MR. STROM: I imagine you people are more interested in the area problem. The solution of a localized problem does not necessarily give you a solution for an area problem. It gets your air away from this local region, but it still combines with other sources to reach further down. Some is going to get to the ground eventually, and to that extent it may not cause so important a long-distance problem as a local problem.

MR. ELLIOTT: It spreads it over more.

MR. STROM: That is right.

Then, of course, you have the specialized effects, like in a valley. All you can do is to stop operations. It is a matter of what you do



locally; as long as it is within that valley it is not going to solve that problem.

So you have these various specialized cases as to which I think the only solution is to cut down the amount of pollution.

But generally, I think the local type of problem can be solved by a technique of this type. The broad problem is something else. We hope we may be able to contribute to it in the future, by developing it to a higher degree of refinement; but there is a lot yet to be done.

THE CHAIRMAN: On behalf of the Committee, Mr. Strom, we wish to thank you very much for giving us of your time, and for the valuable information you have given us.

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---Whereupon the further proceedings of this Committee adjourned, to reconvene on Thursday, October 25th in Trenton, New Jersey.







P R O C E E D I N G S

of the

SELECT COMMITTEE APPOINTED BY THE ONTARIO LEGISLATURE  
TO ENQUIRE INTO CERTAIN MATTERS AND LEGISLATION  
REGARDING SMOKE CONTROL AND AIR POLLUTION IN ONTARIO.

Mr. A. H. Cowling, Chairman.

Dr. F. A. Evis, Secretary.

- - - - -

VOLUME XXXV

Thursday, October 25, 1956.

TRENTON, N. J.

- - - - -

R. C. Sturgeon,  
Official Reporter,  
Parliament Buildings,  
Toronto, Ontario.



P R O C E E D I N G S

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Presiding.

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T H I R T Y - F I F T H   D A Y

Trenton, New Jersey,  
Thursday, October 25th, 1956,  
10:00 o'clock, a.m.

- - - -

The further proceedings of this Committee  
reconvened pursuant to adjournment.

Mr. J. P. Robarts, Q.C., Chairman,  
Presiding.

PRESENT:

Hon. Mr. Kelly,  
Messrs. Morningstar,  
Elliott,  
Murdoch,  
Gordon,  
Macaulay, Q.C.,  
Thomas (Oshawa),  
Dr. F. A. Evis, Secretary.

APPEARANCES:

Mr. H. A. Belyea,	Chief Air Pollution Officer, Metropolitan Toronto.
Dr. Miriam Sachs,	Chief, Bureau Adult and Occupational Health Trenton, N.J.



Dr. R. H. Daines,	Plant Pathologist, Agricultural Experiment Station, Trenton, N.J.
Mr. William Munroe,	Co-Ordinator, Air Sanitation Program, Trenton, N.J.
Mr. E. Powers Minsher,	Legal Advisor, State Department of Health, New Jersey.

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---The following proceedings were held in the offices of New Jersey Department, 211 East State Street, Trenton, N.J.

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MR. MUNROE: In New Jersey, we do not refer to it as an "air pollution" program, as far as the Health Department is concerned; we have a rather more positive type of title, and call it "air sanitation".

I co-ordinate the Department of Health facilities to do work on the problem of air pollution.

THE CHAIRMAN: And is this new legislation here in New Jersey, setting up this Commission and your department?





MR. MUNROE: The Air Pollution Control Commission is within the State Department of Health.

MR. ELLIOTT: It is not by municipal by-law?

MR. MUNROE: No, it is a State law.

THE CHAIRMAN: And does the Commission report directly to Dr. Sachs?

MR. MUNROE: No, the Commission reports directly to Dr. Bergman if there is any report. But actually it is set up as rather a unique arrangement.

It says it is within the State Department of Health, but makes Dr. Bergman one of the Commission members in order to have some framework in which to set this Committee.

The Department of Health is one of eleven departments within our State Department here in New Jersey. Dr. Daniel Bergman is at present the Commissioner of Health in New Jersey.

The Department of Health is subdivided into nine basic divisions.

THE CHAIRMAN: Is the doctor



elected?

MR. MUNROE: The doctor is appointed. The Commissioner of Health is an appointed official, and all departmental heads in New Jersey are appointed officials.

As I said, the department is subdivided into nine basic divisions. One of them--and the only one that we are really concerned with in our discussions this morning--is the Division of Constructive Health. This division breaks down further into several bureaux. The one with which we are concerned this morning is the Bureau of Adult and Occupational Health. Dr. Miriam Sachs is the chief of this Bureau of Adult and Occupational Health.

The bureau activity is further divided into three basic programs, one of which is radiological health. Radiological health is a program now gearing itself to the work of the public health aspect of the use of isotopes and atomic energy in industry.

The second program is occupational health. This is essentially industrial hygiene.

The third, Air Sanitation Program, I am co-ordinator of this program and Dr. Sachs



is chief of the Bureau.

The function of co-ordinator under the program in New Jersey is to co-ordinate all the basic activities of the Department of Health to achieve what the Department has decided upon.

One additional division which becomes important to the operation of this Air Sanitation Program is what we call our Division of Labs. The Division of Labs. is again one of the basic sub-divisions at this point, and it is in this Division of Labs. that they have separate bureaux, one of which is the Bureau of Chemistry. The Bureau of Chemistry provides all the laboratories and analytical services for the Air Sanitation program.

Administratively it is set up this way so as not to create a whole series of laboratories within the department for each agency which requires laboratory analyses, but to create one centralized laboratory function which theoretically should provide all services of an analytical nature for all parts of the department which require analyses.

There is also further co-ordination



between statistical services. We have in our Division, a Division of Vital Statistics statistical services, which are also available to the Air Sanitation program, and help us to statistically correlate information that we gather in air sanitation. This will make a little more sense as we get on into discussion of what we do; but I thought it would be interesting for you to see how it is set up within the framework of our government.

MR. MURDOCH: In your Bureau of Air Sanitation, I presume you have more or less departments?

MR. MUNROE: Further subdivisions within that, yes.

MR. ELLIOTT: You break it down into several departments?

MR. MUNROE: We have completely run out of titles at this point, so we are calling them "sections".

THE CHAIRMAN: As you may know, we are an all-Party Select Committee of the Ontario Legislature, appointed to enquire into all matters regarding smoke control and air pollution. We are an all-Party Committee, as you will realize the air-pollution transcends all Party lines. We have visited a number of localities, and now we are here, hoping to receive information from you, which will be of benefit to us in our work.





DOCTOR SACHS: In addition to the material distributed we made two packets. One is the proceedings of the Governors' Conference on Atmospheric Pollution. This was held in February, 1952, and we printed the papers. These are technical papers. There is one on the effect on plants and vegetation; types and controls; and it is a good solid scientific background kind of thing.

Then, one of our universities here, Rutgers, which has a very good law school, came down to discuss air pollution shortly after our air pollution law was passed. And this is the report from The Rutgers Law Review which dissects the Bill in its different aspects, and gives a number of legal references to other air pollution decisions and laws throughout the United States; and this has been very valuable when we get into discussions with lawyers.

THE CHAIRMAN: We try to keep away from them as much as possible!

DR. SACHS: This is extremely helpful. It says, according to New Jersey law, that the law is sound, it is constitutional, it is



very much in our favour. So we distributed rather more than we would have otherwise. This is a very valuable thing for any legal people you may have with you in drawing up a Bill. It discusses "public nuisance" and gives it a legislative definition, and so forth.

There are a few copies of the Act in each of these, and a few copies of our first chapters of the Code.

Actually in New Jersey, Air Pollution Legislation or demands for legislation did not get very vocal until 1950. There was at that time a Bill introduced into our Legislature, which was defeated.

THE CHAIRMAN: Why was it defeated?

DR. SACHS: It was Jones's first Bill. I presume - I do not think I was here at the time - that there was a very strong industrial bloc. As nearly as I have followed air-pollution legislation since that time, when the State Chamber of Commerce and the New Jersey Manufacturers' Association got together, the Bill would usually pass our Assembly, but then be blocked in the Senate; and that was pretty



routine every year it came up, until 1954.

The 1951 Bill was very brief, and placed air pollution under the Department of Health. Even the Department of Health did not want it; they did not go out to try to get support for it, or speak in favour of it when asked, because at that time - and it is amazing that we have developed so in five years - everyone, not just in New Jersey, would not discuss a Bill on air pollution, you would not know where to begin or what to do.

There were not enough places working on it and gathering background. Air pollution control devices were not as advanced then, even as they are now. So all you would have would be a piece of paper, and it was not a good thing to burden the administration with.

In the following year a Legislative Study Commission was appointed, with certain members from the Assembly and certain members from the Senate, and certain people selected from industry and other interests, - a little bit like this Committee that is meeting here today, with the exception that there were some people on it who were not members of the Legis-



lature. They were to study air pollution problems in New Jersey and come up with a recommendation to the Legislature whether (1) there should be a law on the State level and (2) if they decided there should be a law, to recommend a type of legislation.

After that the Committee sort of vanished, and at the end of the first year they asked for an extension of time because they were not ready to write a report. They did have a fairly good appropriation to use for their studies and their travels; and suddenly, in March, 1952, they prepared a report which went to the members of the Legislature, and a few copies to the State Library, and then the Committee finished.

THE CHAIRMAN: They did not get re-elected - is that it?

DR. SACHS: It was a one-year study Commission, and the way they do that in New Jersey, a resolution is passed as usual for the time that the Legislature is in session, and if it is not extended, it goes out of existence. That Committee's function was finished when they wrote their report and turned it in.





They were not supposed to do anything else.

I should like to introduce

Dr. Robert Daines of Rutgers University. . He is Plant Pathologist at the Agricultural Experiment Station. He was Secretary of that Study Commission, and he can, from personal experience, probably tell you more about it if you want to know about it.

Their report, in essence, said that it was an air pollution problem, that the municipalities in New Jersey were not large enough and, because they were not large enough, were not wealthy enough to support a real air pollution control unit. . . . .

I think, Doctor Daines, you ought to pick it up from there and tell them your feelings about it. I know that from where I looked, it seemed entirely different from the way it looked to the Study Committee.

DR. DAINES: As has been intimated, a Committee was appointed by the State Legislature to study air pollution in the State and make recommendations, and as intimated, the Committee consisted of two members from the Assembly, two



members from the Senate, and then representatives from various fields, people who were not elected members of the House or the Senate.

We made a study in the State, and discussed the problem with all groups of which we knew that had been active in air pollution, - not in producing air pollution but in controlling it, and concerned with the affects of air pollution.

Following that, two of us made a trip around the nation and went to many places where legislation had been in effect, and discussed with them the reasons for legislation, the type of legislation they had, its effects on correcting the situation, its effects on industry, and so forth. Certainly we wanted to arrive at a decision here that would allow all interests to live. It was not our intention, or the intention of anyone, I am sure, to place undue burdens on industry or the municipalities that are engaged in activities which may result in air pollution.

At the same time we wanted our air as healthy and as comfortable as could be reasonably achieved.

Our trip around the nation convinced us that in industrial areas, where air pollution



was a problem, satisfactory reduction of the air pollution problem very likely would not occur through voluntary measures, yet much good might be done on the basis of voluntary measures, bringing to the attention of industries, municipalities and individuals concerned, the problems which were created. Working with them there were a number of sections that had been trying voluntary measures for a number of years to correct the problem, and who had become convinced that legislation was necessary.

Yet, legislation has some draw-backs. We felt that, by and large, the beneficial results to be achieved outweighed the draw-backs which might occur, so we recommended what we thought was the best form of legislation to meet our particular problem.

The legislation which is passed is a modification of the original recommendation. It is quite similar, but there are some deviations. I do not feel that I am in a position to discuss the merits. I think time alone will tell whether the modifications are good.

MR. MACAULAY, Q.C.: What is the nature of the modifications, Doctor? The liberalizing of it or the limiting of it, - the general ambit of



the legislation? Was there any sacrifice of principle, in short?

DR. DAINES: No. I think that probably the results are neither liberalizing nor making them more stringent.

MR. MACAULAY, Q.C.: The changes were just of a technical nature?

DR. DAINES: Yes. The changes, as far as I am concerned were rather minor. One change which was made I am sure the Department of Health of New Jersey feel is good, and maybe it is good; I do not know. The change

I have in mind - this was the unanimous feeling of the Committee - was based on the feeling that air pollution is a problem which affects all departments of government. Perhaps that is an over-statement; it affects a number of departments of government, and all classes of people, and because it does affect a number of departments of governments, and legislation unwisely administered or enacted can be so destructive to certain segments of our population, we felt that the very widest basis should be set in administering the law.

For that reason we recommended that





no one department of government be too strongly represented. We recommended, for example, that the Department of Health have one member; Agriculture have one member ---

MR. MACAULAY, Q.C.: But it still is administered under the Department of Health?

DR. DAINES: Yes; and our recommendation was that it be not under the Department of Health. I think perhaps we made a mistake in that. I think this is where the greatest interests are, and certainly it should be put in the department where they have the greatest interests.

The Department of Health is only one of several departments affected, and for that reason we did not want any one department too strongly represented. We did not want one department in a position to control, if you understand what I mean, and our feeling was, too, that if there is any case resulting in litigation, we would have to be defended by the Department of Law and Public Safety anyway, so why not put it there, - a neutral group which has no roots in air pollution, so to speak, if they have the job of defending us anyway.

MR. BELYEA: What are some of the



other departments which are represented?

DR. DAINES: Agriculture, very definitely; Labour.

MR. ELLIOTT: Education?

DR. DAINES: Yes.

MR. THOMAS:(Oshawa): You have a Municipal Affairs Department?

DR. SACHS: No, we have not.

DR. DAINES: Well, our decision was what we have indicated. My feeling now is that air pollution should be, if it is expected to do the job it should do, in the department which is really interested in the problem, and for that reason if we were doing it again, my vote would be to put it in the Department of Health. But my vote also would be to try to have the composition of the "Board of Directors", shall we say, of such a nature that no one group could dominate.

THE CHAIRMAN: What would your views be of a small Commission, say of maybe three, reporting directly to the Chief of the Commission of Health in the which would be autonomous. The appointments could be made by the Governor.

DR. DAINES: Whom would you have in mind for the three; or do you not have ----



THE CHAIRMAN: No, I am just asking the question. Suppose we had a medical man, an engineer and an independent thinker on it to which all air pollution problems concerning the municipalities could go, and to which the municipalities could go for help, technical and scientific advice, particularly those who are not in a financial position to do it on their own?

DR. DAINES: Well, I think there is always an advantage in small groups. Decisions are hard to arrive at if your group is too large. I also feel that the decisions that are made might be so important with respect to the life of industry - I mean, decisions could be made which would make the profitable operation of industry rather impossible - since the decisions are so important, I personally might like to leave it to one or two or three men.

Our thought was, since decisions are so important, and so many segments of our population are involved, probably we ought to have on that committee engineers, people in the Department of Health, people in the Department of Agriculture, perhaps someone who understands the law, and so forth.



We felt that the Committee might be better by being a little larger.

MR. MACAULAY, Q.C.: What power would that Committee have Doctor?

DR. DAINES: What we recommended was - and it is true in our Department in the air pollution group now - that they have a commission empowered to arrive at setting standards. In other words, the legislation as it originally passed is just enabling legislation, appointing a Commission; and a Commission of three men, as you suggested, or more, would have the right or the responsibility of deciding. For instance, "fluorine; 'We will tolerate one part in a billion", let us say. They set standards which they consider will be acceptable.

THE CHAIRMAN: And is it also a place where municipal people could go and secure advice?

DR. DAINES: Certainly should be, I think. It seems to me that the group ought to be a group into which about all the air pollution work in the State is funnelled, and to which anyone with a problem can go for help.

THE CHAIRMAN: Do you not think that a smaller group of three could call upon technical





representatives of industry as required, and probably get more action than if they were actually represented on the board?

DR. DAINES: Yes, I think that is true, - if you always have three men who will call for advice.

MR. MACAULAY, Q.C.: The Doctor is talking about a regulatory and executive board of people who have power to do things and summon somebody if they can not do it. You are talking about an administrative, supervisory group of people, whose standards would be set in the legislation.

DR. DAINES: I am not on the present Commission. I was on the Study Commission.

MR. MACAULAY, Q.C.: There were two different commissions. He sat on the study group.

THE CHAIRMAN: All of my comments are on the Commission now.

MR. MACAULAY, Q.C.: It has power to set standards. In short, the standards are not set in your Bill. The Bill merely set up a body and said, 'Now, we have set you up, go ahead'. That is not what we envisage. So his Commission would



have an entirely different function from ours.

THE CHAIRMAN: I do not think so. Generally speaking - and correct me if I am wrong - the Commission you set up is one which regulates, controls and generally supervises air pollution in the State; and the one I was talking about would perform mainly the same functions, only with a smaller committee.

DR. SACHS: I think we are talking almost about the same thing. There is a little confusion arising, - basically I think it can be accepted that your biggest impediment to air pollution control is not administrative, it is scientific. You do not know, really you do not. You do not know what to set as standards, and you do not know what, as a matter of law , must be installed on such-and-such a type of operation, or what the chemical industry can do, what a foundry can do, what an automobile assembly plant can do.

I am sure that you are probably much better versed than I am on what is going on in other parts of the United States. You have seen in Los Angeles, for example, where they have set many, many standards, and some of them, I am sure



to the people concerned - the petroleum industry, some of the foundry group - have appeared to be pretty high-handed. They would meet those standards "or else".

And yet, by everybody's admission, the smoke in Los Angeles is almost as bad now as when they started in 1947 and 1948, to organize their Los Angeles County Air Pollution Control District. Something that they were not aware of, that they are just beginning to try and unravel now, is still increasing, despite rather rigid standards that are written into their code, and which, for many people, have been very costly to meet.

I think our engineer friend probably understands what I mean.

THE CHAIRMAN: That is a very good picture, Doctor. Very simply, my question to this Doctor was, to give us his views on a large Commission of nine with their functions, or a small committee of three with the same functions. Let us put it on that basis.

DR. DAINES: I would have to say that I think the small committee of three would be more efficient.



THE CHAIRMAN: That is all I wanted to know. Thank you very much.

DR. EVIS (Secretary): Is there not difficulty in Los Angeles through the terrific increase in population, the number of automobiles, and so on?

DR. SACHS: Yes, I think that is perfectly true. But it did not prevent them at the same time from putting in very strict standards, and what they thought at the time was going to solve their problems.

I think we had better go back a little bit, if you do not mind, and pick some of this up. I do not really know your structure of government in Ontario, and I am at best no student of government. I have an M.D. degree. But what you are going to do is going to be influenced by what is the administrative law structure of the unit and sub-units with which you have to deal.

To me, for example, it can become very confusing. I have been at small group meetings where Dr. Greenburg, who is the Commissioner of Air Pollution Control in New York State, has met with Dr. Bergler, who is





our State Commissioner of Health in New Jersey, and New York City is a municipality with eight or nine million people and has an entirely different problem, a much more expansive budget, and much more strictly local police power than has the New Jersey State Department to help us, with a State of five and one half million people.

I am aware that we are supposedly on a much higher level, but we here are only a small state. We have a much smaller operating budget, and a much smaller staff. In some respects we have a good deal more legislative authority.

At the same time our municipalities, whether with a population of half a million,

or three hundred, have strong local autonomy, which is given them by the legislature when they incorporate as townships or burroughs, or whatever they finally become. So that we have a little different problem in working down to actual street level of where air pollution is occurring.

MR. MURDOCH: In that case, if every municipality tackled the same problem with the same vigor as New York City, the State would not



have much to do with it?

DR. SACHS: No, except that New York City happens to be the chief city in the United States. I do not know how it stacks up against London now. It is a little bit unique. I have worked in the past in government in New York for the State and the City Health Department, and New York City wags New York State. It does not work the other way.

So the situation in New York is in some ways very enviable. It is very nice to be at City level and go ahead with what you want to do. At the same time, when you are working at the State level, it is a little bit uncomfortable to write a saving clause that "This law will apply to all municipalities up to a certain population". That is a very difficult situation.

THE CHAIRMAN: You might be interested in knowing that in our travels across your Country - and we have been in many States - New Jersey is one of the few States with any legislation at all. In the majority of cases they leave it practically up to the municipality. That is so, I believe, in Detroit, Chicago, Philadelphia, and so on. So that is why we are particularly interested in



talking to you folks, because you are talking on our level.

I might say too, dealing with municipalities, we deal with them in a little different way than you do, in that we have a little more control over the municipal set-up than you have. They are not so autonomous at home, - which is a good thing in trying to do what we are trying to do.

DR. SACHS: When we talk of air-pollution control at State level, we come up against the cost of maintaining that control. If you are going to have a technical staff of engineers and chemists and equipment for testing the environment, plus a home laboratory to which you bring your samples, you soon find you outgrow the test tube and you go into things like spectographs and all kinds of recording devices. People talk even in terms of electron microscopes - which is a small \$20,000. item - to investigate dust.

That is only part of your program. You have to have a special room with air conditioning and humidity control, and you have to have someone who can run it, and he is not a \$3,000. a



year man.

It is for this reason - which is not true of New York City - that our smaller municipalities, and even our largest one, which is Newark, would have difficulty in supporting the broad spectrum of all you need to prove the violation of some air pollution code rule or regulation, or to do the amount of research and study which is necessary for any progressive air pollution group to help you arrive at the standards.

I mean, what is the standard of clean air for New Jersey? It is not going to be the same for New Jersey as it is for some mid-Western State which may be entirely agricultural. We are not going back to that very simple level of living.

New Jersey wishes to maintain its position of having more chemical industry than any other State in the United States. We are not the smallest State - Rhode Island and Delaware are smaller - but we have more chemical industries than any State in the Union, including New York and California. This is a very lucrative source of income for the State, and makes it the place





where people work, and what builds up New Jersey as a very strong State.

We are going to have to sacrifice something. We are not going to have clean country air of a kind we are familiar with on the shores of a lovely mountain lake. The reason we think air pollution essentially ought to be investigated by a group which is fully representative is that, while we might compromise a little on our standards of cleanliness or nice smell or no dust on our furniture, we do not want to compromise on the health of the people.

We will compromise a little bit, to the point where we are not making guinea pigs of the population.

That is why the fundamental interest in this compromise ought to be to allow no more than is safe. That is a little different from no more than you would like to see.

These are problems which people who are trained in public health and are used to doing epidemiological studies on disease or causes of illness or lung troubles are trained to follow through. The soiling of your house paint, the corrosion of the metals on cars,



fences and buildings, are all extremely important economically, but the basic thing really to worry about is, if it is doing that to paint and car bodies and metals, what is it doing to the people?

We have always felt that when we can have sufficient data and records to show that this is important to the health of the people, we are never going to have arguments from industrial groups or municipalities or railroads or people who are running or operating something which is contributing to air pollution.

MR. MURDOCH: I wonder if you could tell us what actually started the air pollution work in New Jersey. Was it a demand from the people, or was it pressure from another State, or perhaps the Federal government?

DR. SACHS: No. Dr. Daines said, as you remember, that he would now feel that air pollution control ought to be in a department that is at least interested in it. I am sure it happens in Ontario that there are people, like those who write letters to the editor - they are always writing somebody, they write to the State Board of Health - which is the wrong name ---



MR. MURDOCH: In Ontario most people write to "Bob" Macaulay.

DR. SACHS: Are you not lucky to have it go to someone else, --- and they will say, "There is a factory or a dump or a railroad right near us, and the smoke or the fumes or the odours blow into my house and it is making my baby sick".

MR. MACAULAY, Q.C.: Are you saying, in short, that it was public opinion?

DR. SACHS: It was public demand that first aroused the interest of the Health Department, and where the requests for assistance or complaints went to other departments they were channelled to the Department of Health, for one other very important reason. Not only the health aspect, but because we do have occupational health units and industrial hygiene units for the survey of any plant working conditions, and which has at least the beginnings of a set-up to test for sulphur dioxide or lead or mercury or hydrocarbons, or whatever it is.

Of course they need change and they need adaptation, and you have to be able to collect larger and larger volumes of air. It



is not as simple as in plant work. But at least you have a little nucleus of people who have heard of these substances in quantitative estimates, not merely subjective response to them.

One of the major reasons for suggesting the Department of Law and Public Safety in respect to the original Air-Pollution Bill which was recommended, was strictly budget. They had no laboratories, they had no engineers, they had no chemists, they had no physicians. We are faced with either developing a great deal of machinery and personnel or working out, even if we are in the same building, a complicated channel of information where when they saw a situation, would send it to the Superintendent of Health, it would trickle down to the appropriate Bureau, and they would eventually schedule an investigation, they would write a report, and it would then go over here, and a decision might eventually be made to use this data.

Someone might say, "If we got our own, it would be much quicker and we could talk to the people and see what they are doing". If you are interested in passing legislation, keep away from





the dollar sign. No money is mentioned in this Act.

The original Act did mention some kind of an appropriation to set up this new unit. The Bill of 1954, which I think you all have a copy of, prescribes the setting up of a Commission, the duties of the Commission, the duties of the Department, and there is nothing in it that says they are going to get even five dollars to post a little notice that they are going to operate an air pollution control.

This is very popular with legislators and their constituents.

MR. MURDOCH: Some members are asked to work free on Commissions.

DR. SACHS: On our Commission everyone works without salary, but he does get expenses.

MR. MACAULAY, Q.C.: I would like to see if I misunderstood your answer to a question I asked you. I asked you, and so did the Chairman, what was the real thing that brought this about, and you appeared to give an answer, but you qualified it; you said, "Yes, it was a public appeal that got the Department of Health going". But who got the legislators going?



DR. SACHS: The newspapers.

MR. MACAULEY: Then it was all through public opinion?

DR. SACHS: Do not forget the Dcnora disaster. If you are going to have a disaster it is nice to have a control programme before you have it. It is nice to be able to say, "We do not want to wait until you have a disaster".

MR. MACAULAY, Q.C.: Would a person who was not even remotely interested in air pollution have been aware that there was some kind of public campaign to obtain cleaner air, or were you sensitive to it because you were interested in it. In short, how strong was this pulsation of public reaction?

DR. SACHS: I think it is very strong.

MR. MACAULAY, Q.C.: Well, it is now, but what was it then? It was not strong enough to allow your 21 senators to pass legislations, was it?

DR. SACHS: No.

MR. MACAULAY, Q.C.: And it was not for several years. Did public opinion increase during that time?

DR. SACHS: Yes, it did.

MR. THOMAS (Oshawa): The problem is not as



great, is it, in New Jersey as in New York City, because of the prevailing winds?

DR. SACHS: It depends upon to whom you speak.

MR. THOMAS (Oshawa); Well, we have heard that remark in New York City.

DR. SACHS: I do think that with certain weather conditions we probably contribute to the New York City problem.

MR. MACAULAY, Q.C.: But someone contributes to yours?

DR. SACHS: We have done surveys where the only thing we could link it with was something in Pennsylvania, but we do not "scream" at the boys in Pennsylvania, because they are worrying with their problems, and when we solve our problems and Pennsylvania and New York solve theirs, the problem will be solved.

One of the dirtiest conditions we ever recorded on our tape recorder were some forest fires down south; and we also had some smoke coming down from Canada.

MR. MURDOCH: It was clean smoke, was it not?

DR. SACHS: There happens to be



industry between our City and Canada.

MR.MACAULAY, Q.C.: I think the point I had in mind was partially covered.

DR. SACHS: I think it should be emphasized that in New Jersey, in the Department of Health, long before this Act was passed, we had an air-sanitation program and it functioned, as was mentioned earlier, through a technical advisory service, municipal governments helping them to solve problems within their municipalities.

MR.MACAULAY, Q.C.: For inside or outside factories?

DR. SACHS: Outside. It was an air-sanitation program. Actually all this Act did when it was passed was to formalize our program. The Health Department is now made responsible for carrying out something it had been doing for a number of years, with the exception of this unique thing, that it makes the Health Department responsible for such things as paint discolouration and property damage. That is the only thing which was really different.

THE CHAIRMAN: According to "Code 110, Air Pollution," you say, "Life and property throughout the State in such territories of the State as





shall be affected thereby, and excludes all aspects of employer-employee relationships as to health and safety hazards". Why would that be excluded?

DR. DAINES: The reason it is excluded is that in New Jersey the State Department of Labour has a fixed responsibility for the health and safety of workers inside industry, and it is also intended to eliminate any conflict along that line. The State Department of Health has also an interest in industrial hygiene. It was intended to remove any doubt as to responsibility in the area of air control.

MR. MACAULAY, Q.C.: Do you think air pollution should go inside as well as outside?

DR. SACHS: This is an entirely different type of problem. If you feel that you can include completely different types of problems within one structure, perhaps the answer is yes; but in my experience they are so much different there is not a logical basis for handling them.

MR. MURDOCH: You agree that both deal with analyses and sampling and testing of air?

DR. SACHS: They do, that is in some



respects fundamentally, but the general procedures are quite different.

MR. MACAULAY, Q.C.: But it might be a more efficient means of organizing, if you have to have one administrative group and all the office equipment in one place, and another group in another place, if they could all be under the same directorate. Nobody would be duplicating any work, and you would have one chief administrator for the two branches of the same air study.

THE CHAIRMAN: That is right. It is all air pollution.

DR. SACHS: We do have that, but we have it under the Department of Health.

MR. MACAULAY, Q.C.: But do you agree it is a possibility?

DR. SACHS: That is exactly what we are doing. Our Department of Labour has not much of a laboratory set-up.

THE CHAIRMAN: Are you actually doing it, then?

DR. SACHS: Yes.

---Whereupon a short recess was had



---Upon resuming.

DR. SACHS: Perhaps you people would like to look around a little ---

THE CHAIRMAN: If you do not mind, we will skip equipment. We have had a look at equipment in New York, and maybe yours is along the same line, although a little better, naturally. I think we might continue to chat with you and then "knock off" and we can discuss it maybe at lunch time, and then catch the train.

MR. ELLIOTT: I come from an area which, although there are steel and chemical industries and so forth, we have had very little complaint from our citizens, whether about problems of chemistry, steel or textiles. But I have had terrific complaints about diesel machines operating up grades where automobiles have to follow at slow speeds, and they have been practically fumigated or gassed in their own automobiles. The main problem is with the diesel machines causing partial suffocation of people in automobiles following them up.

The second complaints is regarding garbage dumps which happen to catch on fire, and more



pr less pollute the area for months, particularly in hot weather.

DR. SACHS: Are you having any complaints of diesel fumes attacking plants, or trees or vegetation?

MR. ELLIOTT: No, I do not think there is any problem of that kind.

MR. MACAULAY, Q.C.: You are speaking in relation to buses are you not?

MR. ELLIOTT: Buses and diesel operated trucks.

MR. MACAULAY, Q.C.: On the roads, more than the railways.

MR. ELLIOTT: We have one big road between Hamilton and Toronto, the Queen Elizabeth Way, and it is quite level, but people do complain bitterly of following some trucks and being almost suffocated in their own cars. I have heard the suggestion that we should have a highway for trucks, and trucks only, and another for passenger cars only. It is not all from diesels, it is from trucks generally, sometimes from fuel they are burning which may not be all diesel. But there is a terrific problem in Ontario in the fuel odours given out by trucks





and motor buses, - odours which are objection-  
to people  
able/riding behind them in automobiles.

Have you any of that problem here?

DR. SACHS: Yes, we do have, and we  
have had complaints about it. Part of the  
answer,-probably the whole answer-to that, is  
going to be in a change of design of trucks.

MR. MACAULAY, Q.C.: You have not done  
things like Chicago, which has the power to  
take a bus right off the road, or change over  
to propane gas, or things of that nature?

DR. SACHS: No, we have not. We  
have considered many items for means of control,  
but I do not think anyone around here is particu-  
larly keen on the propane gas -- the liquid petroleum  
gas-idea, which presents many other problems.

MR. MACAULLY, Q.C.: Does it?

DR. SACHS: Yes, it does. It is  
extremely inflammable. There have been serious  
accidents reported in Europe, where it is much  
more popular than it is here. Another problem  
is, I have spoken to the Port Authority people  
who operate the Holland and Lincoln tunnels, and  
at the moment they are doubtful if they would  
allow propane gas propelled vehicles, even



private ones, through the tunnels because of the danger of explosion and fire.

DR. EVIS (Secretary): This last week there was an explosion somewhere.

DR. SACHS: The other thing is, there are these catalytic units which have been described. They are at the moment quite expensive, and they do not function very long. You do not get one and keep it for life in whatever vehicle you are driving; and you then have to think in terms of \$200. or possibly some other amount for replacement, with a very low mileage change-over.

We have been in Detroit and we have discussed some of these problems with the automobile industry, and the Automobile Industries Association have formed committees - I am out of my field now - on re-design, where they are putting in some so-called vacuum-breakers so that this excess fuel cannot be drawn in as the car slows down and then gets shot out of the exhaust pipe when it starts operating again.

In New Jersey we have motor vehicle inspection stations where cars must be taken at regular intervals to have brakes aligned.

MR. MACAULAY, Q.C.: Twice a year, is it



not?

DR. SACHS: Twice a year, yes. And also to have certain other things checked, and we would like to think of something which might be combined with that as a check-point, but we have not been able to come up with any ideas of what would be a fair regulation to pass in this respect.

MR. BELYEA: I agree with everything you have said, but if you had a City which was faced with buying a thousand new buses immediately, and the choice was between propane and diesel, would you then make a recommendation for propane?

DR. SACHS: What do you think, Mr. Murdoch?

MR. MUNROE: It is hard to burn diesel to a completely clean exhaust. I would guess that you could probably, under proper conditions, burn propane to a more clean exhaust.

MR. BELYEA: We are faced with that, and it is my opinion that diesel at the moment is not a satisfactory answer. Propane is not completely satisfactory, but it is reasonably so.

DR. SACHS: There has been a series of tests. There again it is a maintenance problem



and the proper operation of your vehicles. There is quite a bit of objectionable exhaust from propane.

MR. ELLIOTT: In your law, are they included under automobiles, trucks and buses, or do you think they should be?

DR. SACHS: They do not need to be specialized. If they are a source of air pollution, we can go after them.

MR. ELLIOTT: You could take them off the road if you felt they were really bad?

DR. SACHS: Yes.

MR. MACAULAY, Q.C.: You do not, do you?

DR. SACHS: No.

MR. MACAULAY, Q.C.: You do not touch automobiles nor motor vehicles in any way, do you?

MR. MUNROE: Depends on who "we" is. If the "we" is the Commission - which has got a writing pad; that is all it is - they have the right if they feel a vehicle is an air pollution problem, to promulgate a code to regulate it. When they have it promulgated, the Commission has no longer any responsibility. It is handed to the Health Department to enforce.

At the moment the Commission has





not given any attention at all to the problem of vehicles.

MR. ELLIOTT: You have not had it brought to your attention from anyone in this City?

DR. SACHS: Only from the public, in occasional letters relating to the subject.

DR. EVIS: (Secretary) You have a Commission which makes rules which have the effect of law?

MR. MUNROE: The procedure for promulgation is outlined in the brochure you have.

DR. SACHS: There must be a public hearing; and when they are adopted in final form they do not become effective for at least 60 days after the date of option, so that there is a small change-over period.

MR. MACAULAY, Q.C. The advantage of that is you do not have to go through the preliminary procedure to change the regulation, and have it put in force. The disadvantage is that it is more difficult to pressure a whole parliamentary system, such as we have in Canada, which you do not have in the United States. It is much easier to impose your will upon a small



Commission than it is on a 98 -Member House.

DR. EVIS (Secretary): Since this is a growing science, and standards in many respects are likely to change from time to time, it might be a good idea to make provision for Orders-in - Council.

MR. MACAULAY, Q.C.: Yes, or absolute minimums or maximums. But I would be rather opposed to the Commission setting up the standards.

MR. MURDOCH: Usually we put a provision in the Act that the Minister may make regulations, provide for fines, and so forth. But when he does that he has to take the regulations to Cabinet Council, and it has to pass the Cabinet Council, - which brings it the combined knowledge of the group of Ministers.

MR. THOMAS (Oshawa): If you receive a request from a municipality to set up a Department of Air Pollution in a municipality, would you be willing to assist them in an advisory or financial capacity?

DR. SACHS: Yes. We have even gone so far as to let them hire a field man who has a pretty good basic training in engineering, and



have him work with us for awhile. You cannot buy air pollution people. The whole background of it is so new that they are just a relatively small number of people who have had five years' experience in that field, and we help in the training, and he can do a great deal in smoke control, for example, or certain things that he sees, which he can check; and then we will go so far as to even loan certain simple equipment, and receive samples and examine them in our laboratory, should it require extensive analysis or experimentation.

We would like to see strong local controls on certain situations, because the people in an individual community know their own problems better than we do, and they know how far they want to be restricted in certain things, and they know how far they want to be liberal in certain things; and just so long as any local codes or ordinances are not in conflict with which are in the Statute Books, they can be much more restrictive if they want to.

MR. THOMAS (Oshawa): If they want to.

DR. SACHS: But, of course, we would



expect ours to do the job, and if they wanted to do even more than that, they would have the right of decision for themselves.

The other reason is; it is a good idea to have some State level control is that air pollution, above all problems, does not stay local, and if Town "A" had a very large industry, where most of the people of that town work, and yet most of the objectionable material from that industry floats over into Town "B", which is collecting no taxes from Town "A", and maybe not so many people work there, they would tend to find it more objectionable, but they have no right to go into Town "A", unless on a friendly basis, by having the Mayor or local officials talk it over, and insist on something being done if it is possible to do it.

Now, in a problem between towns, or between counties, it is a practical and a good way of operating to have a State level body to handle that type of thing in essence; and when it gets beyond the confines of one State and we have a New York - New Jersey problem,--you have the thinking behind an inter-State body for this particular problem, to review the borders,





or that particular region.

MR. MACAULAY, Q.C.: What about the question that Mr. Elliott asked you? What regulations have you promulgated in relation to garbage dumps?

DR. SACHS: We gave you a couple of chapters of the Code on that.

MR. MACAULAY, Q.C.: Would you tell us briefly what you do do about it.

MR. MUNROE: Yes. The first Code which was passed by the Air Pollution Control Commission was designed to regulate air pollution from open-burning types of burner.

MR. ELLIOTT: What about the back-yard incinerators? Have you got them?

MR. MUNROE: Incinerators are not covered yet by the Code. It is the intent of the Commission to promulgate a Code to regulate incinerators.

MR. MACAULAY, Q.C.: You do not cover municipal incinerators at all?

MR. MUNROE: All types of incinerator. At the moment all we are doing with this Code is prohibiting the open burning of refuse. "Refuse" is defined as being a lot of things that are



waste materials.

Secondly, we prohibit salvage operations by open burning - automobiles, metal scrap yards, or any operation where you are getting rid of something you do not want to get something you do want.

MR. ELLIOTT: How about separating copper parts and zinc parts? Have you got foundrys which are doing that?

MR. MUNROE: Nothing but the open burning aspect of salvage is covered by this Code. It prohibits open burning. It does not prescribe the alternatives you may substitute for open burning.

MR. MACAULAY, Q.C.: So it would not have anything to do with soil compaction on dumps or anything of that nature. All you say is, " You cannot burn the stuff".

MR. MUNROE: That is right.

MR. MACAULAY, Q.C.: Do you not think it is like a one-armed paper hanger with the itch, trying to cover the problem, without at the same time covering municipally-operated incinerators?

MR. MUNROE: I think that would be very desirable.



MR. MACAULAY, Q.C.: Have you been studying municipally-operated incinerators?

MR. MUNROE: The Commission was only organized in February, 1955, and since that time it has had a Committee which has been trying to gather the information. However, this does not dictate how a man must do it. If he chooses to use a sanitary land-fill procedure, this is perfectly satisfactory from the air pollution control view point.

MR. ELLIOTT: You find you are not having too much trouble with it?

MR. MUNROE: We are having a good deal of difficulty in getting this done in New Jersey, and there are many reasons for that. Municipal governments in many cases contract on an annual basis for garbage disposal. It is not practical to change in the middle of a budget year. Likewise, in certain parts of the City large dumps are operated by private contractors, and these fellows at the moment are bound up in municipal contracts, and it will cost them more money to use a land fill procedure.

The enforcement procedure - and



this is interesting - is outlined in detail in the Air Pollution Control Act. For every Code the Commission writes, the State Department of Health as an enforcement agency must use the procedure outlined in the Code, and it is a very reasonable but hard to administer procedure.

It involves two periods of time. It does not give the Health Department the authority to go out and say "stop". We must cite the person as a violator, call him in for what the Act calls, "conference, conciliation and persuasion". During this process we arrive at what will be a reasonable period of time for the violator to correct the condition.

What is reasonable depends a good deal on individual circumstances, or economics in some cases, from the viewpoint of engineering.

MR.MACAULAY,Q.C.:Do you think that is a good procedure? Do you or do you not?

MR. MUNROE: We have not had enough experience with it yet. We have been working with it since May, and I am inclined to think that it is a little difficult to work with.

MR.MACAULAY,Q.C.What would you substitute for it? Do you not think you have to have some





educational process? As the Doctor said, you have to be careful how you just clamp down on these industries. You cannot just put your foot down on their neck. I think they have to be given an opportunity. A lot of them do not even know what they can do.

MR. MUNROE: This provides for conference, conciliation, persuasion. That is the first thing you do. This is essentially education. Sitting down with the fellow and finding out what his problem is.

MR. MACAULAY, Q.C.: You object to it because there is something wrong with it?

MR. MUNROE: I said up to this point we have found it a little difficult to administer.

MR. MACAULAY, Q.C.: How would you improve it?

MR. MUNROE: I do not know at the moment. We have had four months' experience with it.

MR. MACAULAY, Q.C.: In what way is it hard to administer?

MR. MUNROE: First of all, attempting to arrive at what is a reasonable period of time on the basis of the information you get from the



person when you sit down to talk to him.

If he talks economics, it is somewhat difficult for an outsider, not knowing the details of his business, to know whether or not this economic factor is as important as he says it is. As time goes on we will have a better understanding of what can be done.

For example, the metal salvage industry; at the moment there is not one in the State which complies with the Code in the instance of automobile bodies salvage; and only after we have found a way -- or some has -- for complying with this Code, can we actually enforce it.

So that in the instance of the automobile scrap yards we have a Technical Committee, organized by the scrap yard dealers in New Jersey, with whom we are meeting periodically. They have engaged a professional engineer.

All the while this is going on they are talking economics. They say, "If you do this, or if we are required to build an incinerator, we cannot stay in business", or "it is going to reduce our profits". We are placed in the position, in the first conference and persua-



sion procedure, of determining whether what they are saying is the fact.

MR.MACAULAY, Q.C.: The Director said this morning that, regardless of the situation in the industry, when it becomes bad for the health of your people, then regardless, I assume, of whether it is economically sound or not, you are still going to enforce what has to be done.

DR. SACHS: That is correct.

MR.MACAULAY,Q.C.: So that, whether something is economically possible or not, before you worry about that you will have to decide, during this period of negotiation, whether what they are doing is bad for the health of the people. If it is, you will not care how economically unsound it is.

DR. SACHS: That is true.

MR.MACAULAY,Q.C.: So you have some principles to sort out in your own hearts.

MR. MUNROE: On the one side we have these principles; on the other side we have a law to enforce, and certain authority for enforcing that law, and certain procedures.

If we are going to enforce it from the viewpoint of the Code, we do not have to



consider the health aspects. If we figured there was health involved we would not need the code; we already have the authority in State law.

MR. GORDON: Your biggest headache is in the enforcement. There will be a period of trial and error before you arrive at some decisions.

DR. SACHS: Actually there are a number of steps which by law are written in the Act for the enforcement procedure. I mean, the conference. There then elapses a reasonable period of time; then you must make a follow-up visit. At the end of that time they have either complied or they are still in violation. You give them a reasonable time to comply. If they do not, the law says they will have a hearing before the Commissioner of Health.

At that time a decision is reached on the basis of evidence, and after a reasonable period of time they have either complied or they are still in violation. At this time the law says you may appeal to the courts for an injunctive relief.

MR. MACAULAY, Q.C.: You have not any power after all these things have been exhausted, to put your pretty foot down and say, "This is it"?





DR. SACHS: No. But, having given them three months, during which time they have not made one single move to solve the problem, I do not think we should have to go through all the rest of that rigmarole, I think we should bring them into court.

You get that feeling about certain individuals, but you still have to go through due process of law.

There are other ways, other penalties. There are different ones with water pollution, there are different ones with other things which seem to work just as well and are not quite so laborious. But this thing was designed, I am sure, as a result of organized industry meeting in committees when the law was being prepared, and they were, I am sure, thinking in terms of a large petroleum refinery, where, even though you decided to do it today, it might take a year to rebuild the process, and they wanted to be sure the law gave them enough time so that they would not find themselves subject to penalty for violation.

MR. MACAULAY, Q.C.: Mr. Munroe said they would not need to worry about the Code if it was



deleterious to health. Is that correct?

DR. SACHS: You know that the law gives the Commissioner of Health quite strong powers.

MR. MACAULAY, Q.C.: Then you would not need to go through this rigmarole; you could go through it another way?

DR. SACHS: We could, but there is practically no proof that any of these conditions are injurious to health. You cannot find it.

I am sure you have read some place that Dr. Coton, in Los Angeles, demonstrated that there is something in automobile exhausts which causes cancer. What he demonstrated was that if you collect enough gas over a long enough period of time and purified it, you found a substance which, if painted on the backs of mice, caused skin cancer. There has been as yet no correlation of this ; and does it cause cancer in the lung of man? You cannot say so; there is no proof.

So the wisest anti-pollution law I could write at the moment does not enable me to prove a health hazard.

MR. MACAULAY, Q.C.: The Minister can



only put his foot down on other things affecting his Department when he can prove in court that there is something injurious to health?

DR. SACHS: I think our State Sanitation Code gave him this power, and it is backed up by the Public Health Law.

MR. MACAULAY, Q.C.: Then he would not have to go to court if he wanted to exercise his discretion?

DR. SACHS: Where the scientific facts are so well substantiated, he does not have to go through his own private investigation. Consider, for example, the case of water pollution. There are standards of our United States Public Health Service whereby so many colloid organisms in water is evidence of health pollution.

When the Commissioner of Health finds that he can take action; he does not have to prove that somebody contracted typhoid.

The tube goes to the lab. and they report so much colloid. We do not have that in air pollution. When you say you are going to write standards into your law, you are going to have a hard time to defining them.

DR. EVIS<sup>S</sup> (Secretary): Can I clear up a point



about garbage dumps? Mr. Munroe mentioned that you prohibit burning, but I see in the Code here, "No person shall dispose of refuse in such a manner as to cause any air pollution".

DR. SACHS: Odour and dust. It had to be put in because you can imagine what would happen if they just let mountains of it accumulate.

DR. EVIS: (Secretary): As they are doing in some parts of Ontario.

THE CHAIRMAN: Do you have any problems in connection with municipal or back-yard incinerators?

MR. MACAULAY, Q.C.: We have been through that.

THE CHAIRMAN: The State legislation in California makes it mandatory for those three different districts concerned - Los Angeles, San Francisco, and San Diego - to set up air pollution control districts or organizations.

Your law is not mandatory on the municipality to do that.

DR. SACHS: I do not think their law is mandatory. Is it not enabling?

THE CHAIRMAN: No, in the three districts it is mandatory; and I think it is the only





State in the Union where it is mandatory.

Maybe you would like to give your views on that, comparing California with New Jersey.

DR. SACHS: I do not know that I have thought about it too much.

The New Jersey Law, as you know, says that the Commission may form County associations where they think it is a necessity.

THE CHAIRMAN: "May".

DR. SACHS: And we have seven which have been organized within the past year. They are all very young. They are still trying to decide on their own set-up, and what the problems are, and what they are going to do.

THE CHAIRMAN: Do you know of any other State where this Commission or Board arrangement is in effect, comparable to yours?

DR. SACHS: Oregon has just a State Board, no County associations.

THE CHAIRMAN: But it is a State Board of Air Pollution, at the State level?

DR. SACHS: At the State level.

The Commission is an appointed body, and we have represented on it technical people.



By and large they are technical people, because part of this problem is to have somebody who has enough background to help you with a solution, and advise what you are going to put in your Code; plus the Secretary of our Department, and the Board of Agriculture, the Commissioner of Health, and the Commissioner of Labour, or the appointed representative.

These are the major interests in the whole problem.

Now the Commission can promulgate; or ammend, or change Codes, rules or regulations, and all the time they are studying the problem, and re-writing the code. They advertise public hearings, they hold public hearings, and receive any briefs which are submitted. Any questions that are raised, they answer. They consider the final form of the code, and they adopt it.

We do a field investigation, and anything necessary to implement the Code. and violations of the Code. Those hearings are held by the Department, first on our level, then at the Commissioner's and then the Commissioner brings an action for the penalty part.

But the Commission does not write the



Code and levy the penalties for violation of it. They are not the whole system; they are the legislative function; and we are the field, or the enforcement function of that.

MR.MACAULAY,Q.C.: Why do you think it is necessary to have the regulatory power in this Commission?

DR. SACHS: Why set up a Commission and write the rules and regulations ----

MR.MACAULAY, Q.C.:---- and have you carry out the enforcement?

DR. SACHS: Well, short of that, you would either hope you had enough technical people who know of the application of these problems, or create advisory committees who would work on certain sections of it or certain parts of it.

It works very well. The Commission form, as we have set it up in New Jersey, works very well. I am told that in Pennsylvania, for example, they could not do it. "Commission" has a bad flavour there; they would not work with a group that is constituted as a Commission.

I think they do a lot of things for you. There are a lot of people, representing different interests clearing the way for you.



It makes your job much easier. They have a certain stature. They are appointed by the Governor and sworn in. They take their jobs very, very seriously. They come to the study meetings and keep their minutes as public records.

When you work with advisory committees it is a little looser. Perhaps it is a hot or a rainy day. Somehow they do not have quite the devotion to duty. We have engineering representatives; we have a representative from the State Chamber of Commerce, from the Air Pollution Control Committee, from the New Jersey Manufacturers, from the officers. The local health officers in the State are very influential people.

When the Code is being discussed, and somebody says, "should we have a committee on automobile exhausts, or foundries or chemical industries", these people go back to their parent organizations, and they undoubtedly discuss it, and start to sell it or start to think in terms of changing it.

By the time of the next Commission meeting, when these things come up, it will get the opinions of the State Chamber of Commerce along these lines, and when the code is





finally promulgated, it has been our experience that we have not had too much organized protest, because all these people, in some way, have had a voice in it while it was in preparation.

THE CHAIRMAN: You have answered the question pretty well, Doctor, but would you like to state the difference between setting up this Commission and having air pollution as a division of the Department of Health. Could we talk about that for a minute?

DR. SACHS: I do not think I quite "get" your question.

THE CHAIRMAN: Do you favour the Commission form of handling air pollution, or would you prefer to have a division of air pollution actually within the Department of Health?

DR. SACHS: We have both. We call it an "Air Sanitation program."

MR. MACAULAY, Q.C.: I think our Chairman was out when you explained that the Commission just sets up the Code and then it is finished. Then the Doctor takes over to enforce the Code.

DR. SACHS: We implement what the Commission has promulgated; and it also gives us



other powers.

THE CHAIRMAN: So the man at the top of the Department is at the secondary level. Right. Which comes first, the chicken or the egg? The Commission is the first, is it not?

DR. SACHS: Only in respect to Codes, rules and regulations.

But remember, that this Commission is set up within the Department of Health. We give them their meeting room and secretary. We go around, take care of them, gather data for them, and so forth.

For purposes of law this looks as though there could be a separation. Actually, when Mr. Munroe and I meet with the Commission, and we say we think we have enough data to write a Code on "foundry emissions" or "power house emissions", they would be very happy to help us promulgate the code. This is a body with which you are working and not fighting each other.

THE CHAIRMAN: You are still not answering my question. If you had no Commission at all, and you had a division of the Health Department looking after air pollution - there is no Commission -



DR. EVIS (Secretary) You would have to go to your legislature to have the laws promulgated.

THE CHAIRMAN: I just wanted you to tell me which you thought was most expedient, - to have a Commission or to have a division.

DR. SACHS: It would be faster if you had just your own autonomous kind of unit, with no Commission sitting; but I would hate to lose all the consultation on technical matters and handling of the groups we are getting through the Commission.

THE CHAIRMAN: That is the answer.

DR. SACHS: I think in the long run that would prove the wisest.

As I said a long time ago, you have got to design this to fit your form of government or administration. You may call it an advisory committee.

We also have in the Health Department, which sits with the Commissioner, what we call a Public Health Council, which is an advisory board really ~~to the Commissioner of Health, and they have~~ them in practically every city. They call them Boards of Health or Public Health Councils, and in some States they are so strong that the



Commissioner functions only as a servant of the Council.

One of the questions which was raised at the meeting yesterday was that in one State, where they were looking at this form of law, their Public Health Council would feel that their prerogatives were being taken away from them and given to a Commission. That is typical for Ohio, not New Jersey.

MR. THOMAS (Oshawa): One bad feature of an advisory committee would be that they would be liable to the opinions of small sections of the population. Instead of being able to introduce legislation which would be for the general good, by waiting for public reaction to certain suggestions from the advisory committee, you are really catering to small groups.

DR. SACHS: Yes.

MR. MURDOCH: In principle, I would say that your Commission keeps the matter democratic. If you did not have a Commission, under the set-up they have in this State, it would tend to be pretty autocratic, if it were run by the Department without a Commission.

We deal with this in a different





manner, but I can quite see that is the only way to handle it here.

DR. DAINES: What I had to say has been pretty well covered.

It seems to me that a Commission, over other forms of administration, has some advantages. In the first place, the Commission consists of seven men who have a scientific basis for judgement. You have mentioned the democratic process of seven rather than one.

The question was brought up awhile ago: which would be the best, to have it determined in the Legislature, or by a Commission? Well, if standards are to be determined or approved by the Legislature, they are determined or approved by men and women who have not the background to make a good decision, in some instances; and so these men and women, to make their decision, have to rely on the judgement of the very few people they approach. But having a Commission, as we have here, the assurance, it seems to me, is protected that the decision will be made by people who have the proper background.

We have County associations which work with the State Commission, and before



standards can be approved, the County associations must be heard from, the problem must be considered with each County association on the basis of what will the standards do to your County. Are they stringent, or not stringent enough?

In that way it does ensure that they will not be enacted for the benefit of small areas with disregard of others because the small areas might be represented better in the group which makes the decisions.

MR. ELLIOTT: There is one thing that comes to my attention.

There is no doubt that you are building big apartment blocks here and there in your big cities throughout the State. How do you find the incinerators within the apartment buildings which are operated by the buildings? Do you have any trouble from them, or are they working satisfactorily?

MR. MUNROE: There have been some complaints referred to the Department. I would question whether or not it would be advisable at this time to attempt to pass State legislation which would regulate down to that level. I do



not think they ever will. It might. But I do not think the Commission would attempt to urge that far down, recognizing the enforcement procedure and the "geography" we have to cover to enforce it.

MR. ELLIOTT: Are you having any complaints about apartment incinerators?

DR. SACHS: They have been very few; and we usually go to local government and go out with one of their inspectors and look into the situation.

MR. ELLIOTT: And that is working well?

DR. SACHS: That is working very well.

You probably heard a great deal about incinerators in New York City. That is not essentially our residential structures in New Jersey; and also, if we do have incinerators in apartment houses and in some of the big installations at Newark or Inglewood or East Orange, they are not very far away from open land. It is cheaper to take the stuff out of the densely-populated communities than to build expensive incinerators. But in New York City they are out of land, and they can



only go up.

MR. ELLIOTT: Do you find them building bigger apartments in the centre of the City or in the outskirts?

DR. SACHS: More in the outskirts.

MR. ELLIOTT: They have a tendency to go out in the country with apartment projects.

DR. EVIS (Secretary): Can you tell us something about research being done at Rutgers on the economic effects of air pollution?

DR. DAINES: May I take just a moment to give you a document as to our research in Rutgers.

Back in 1944 when the war was in full swing, we had some problems along the river, two areas where agricultural crops, particularly peaches and corn, were quite severely damaged by a cause that was unfamiliar to us. I work on peaches, that is the reason I was consulted, because the peach crop was involved.

Our staff studied the area and decided that the injury could not have resulted from diseases or insects or horticultural practices or the weather; and about the only thing left that we could think was involved at all was industry,





and air pollution coming from industry.

So we started work in a very preliminary manner, and were able to reproduce the type of symptoms, including fluorine gas. The farmers in the area went to the State legislature and asked for an appropriation to support some research at Rutgers on air pollution and its effects on agriculture.

Since then we have had a small staff working on the effects of fluorine primarily, but other gases have been studied in their effects on vegetation and agriculture.

That in brief - very brief - is the reason we are in existence.

MR.MACAULAY,Q.C.:How far were these peach crops removed from industrial sites?

DR. DAINES: Where the peach crop suffered was in about a ten-mile area from the plants, - ten miles in any direction.

MR.MACAULAY,Q.C.:From a plant?

DR. DAINES: From a group of plants.

MR.MACAULAY,Q.C.What kind of plants were those?

DR. DAINES: The first ones we had trouble with were plants involved in some of



the phases of production of fissionable material. Since then we have had the same problem around a number of other plants, - fertilizer plants, aluminum plants, steel plants, glass and brick kilns, gasoline refineries.

MR. MACAULAY, Q.C.: Did you find that these things affected other than the peach crop?

DR. DAINES: Yes, a good percentage of the plants in nature are damaged by the fluorine gas, which we studied at rather low concentrations. All of them can be damaged if you have higher concentrations, but a good percentage of them are damaged at rather low concentrations if they are near enough to the plants.

MR. MACAULAY, Q.C.: What happens to the crop? What is the effect on the crop?

DR. DAINES: Well, the peach crop in the area where the injury occurred - the peach trees dropped many of their leaves; the margins of the leaves were burned, and the fruit was dropped; and then there was an unusual type of suture ripening or suture softening of peaches which destroyed quite largely their marketability.

MR. MURDOCH: Was it pretty definitely proved?



DR. DAINES: Some of the symptoms were. I do not want to give the idea that all the suture ripening or suture softening was due to this, but it is pretty definitely proved that gases coming from the plants damaged corn and evergreen trees and so forth.

MR. MURDOCH: I can understand that an industrial scientist might work on that line, and for three years he might think that is the cause, and at the end of three years something upsets the conclusions he has arrived at and he has to start on a new line.

Coming from an agricultural area, and knowing we have this problem in Ontario, we should be very slow in making announcements of these things.

DR. DAINES: Here is the first situation as encountered on air pollution, or nearly the first.

I was invited to attend a Board of Agriculture meeting, and when I arrived the group had met earlier with newspaper men and they had some newspaper publicity already prepared; and the title of the article they had prepared was, "The Atom Bomb Strikes First in New Jersey".



That was what I was confronted with.

We had no evidence; just observations; and that sort of publicity was prepared for distribution nation-wide. My attitude on that occasion was, "Let us forget all about this. These articles must be squelched. If you want to publicize a good sound research program, we will give it all the attention we can and make our facts available to industry and farmers alike". And let me say we have worked on it more than three years, and we have not changed our idea.

MR.MACAULAY,Q.C.: Good for you. When did you start?

DR. DAINES: We started our first research in 1946, in the areas where the first injury was observed.

The farmers were paid for their losses and the situation is now in hand.

DR.EVIS(Secretary): Do you have coloured slides of injured leaves and fruit and so forth, which we might have copied and use as evidence?

DR. DAINES: Yes; I can prepare a set for you and send you some.

DR.EVIS (Secretary): We would appreciate that, and whatever expense is involved, let us know.





DR. DAINES: I would be very happy to supply that.

MR. MACAULAY, Q.C.: You have no proof that the vegetation is harmful to animals?

DR. DAINES: We have not, within the dairies, but there are other States which have evidence that cattle feeding on grass and hay that is in a high-fluorine area acquire very definite pathological symptoms.

MR. ELLIOTT: Hogs and chickens and so on?

DR. DAINES: That is past the stage of guess work.

MR. MACAULAY, Q.C.: What kind of symptoms?

DR. DAINES: Very uneven wearing of the teeth, so that cows, after a short time, find it very hard to masticate their feed. Their joints are very sore. They will be on their knees and almost starve to death before they move to a new area, and they are very sensitive to cold water when they drink it.

Tennessee, Wisconsin and Utah have done a lot of work along these lines.

THE CHAIRMAN: What do you say is the one particular industry, or one particular



type of industry that is affecting live stock?

DR. DAINES: The symptoms I have been speaking of are symptoms which are developed by cattle feeding on a ration that is high in fluorine. Fluorine comes from many sources. It comes from aluminum factories, you have one in Ontario, and I think it is up in the woods, out of the normal area. The problem comes from steel factories which have not properly taken care of the problem of their oxide effluent. It comes from fertilizer factories, - those dealing with phosphate fertilizer.

MR. MURDOCH: And alkali plants?

DR. DAINES: We have had no experience. As far as I know that group of plants is not involved.

THE CHAIRMAN: What about the refining of nickel?

DR. DAINES: I do not know of any. I have been in quite a few States of the Union where this problem exists, but I have never been to one where nickel is.

MR. ELLIOTT: Or copper?

DR. DAINES: No, I have not seen it. The big ones in the United States in



the past have been the aluminum plants, and the steel and fertilizer factories.

In addition to that there are some gasoline refineries which use hydrochloric acid in their process; and there are brick kilns and glass factories, but they are minor.

MR. MURDOCH: We have a nickel factory in Sudbury where the firm pays half a million dollars a year damage to farmers.

DR. DAINES: I would just guess that the problem might be  $\text{SO}^2$  rather than fluorine, although the experience has not been that  $\text{SO}^2$  is a great problem with cattle.

MR. ELLIOTT: It does not harm cattle?

DR. DAINES: Fluorine is the thing that harms cattle.

MR. ELLIOTT: But  $\text{SO}^2$  does not?

DR. DAINES: I think there is no evidence that it does.

THE CHAIRMAN: Would you say that sulphur harms crops generally?

DR. DAINES: Oh yes;  $\text{SO}^2$  is an air pollutant that has caused a great deal of damage to crops.



THE CHAIRMAN: Steel roofs of barns, wire fences, and all that.

DR. DAINES: Oh, your acid fumes would do that.

MR. THOMAS (Oshawa): Do they not have a copper refining plant down in Tennessee?

DR. DAINES: Yes, that is SO<sub>2</sub>, not fluorine.

MR. MACAULAY, Q.C.: You may have a type of plant that turns out something quite different from fluorine and sulphur which may be injurious to crops?

DR. DAINES: That is quite true. We have had experience of injury occurring from chlorine.

MR. MACAULAY, Q.C.: What sort of plants put chlorine into the air?

DR. DAINES: Insecticide factories.

MR. MACAULAY, Q.C.: But it is not limited to them?

DR. DAINES: Probably not. But those are ones with which we have had experience.

MR. MACAULAY, Q.C.: What other thing in the air have you had experience with in this State that has affected your crops?





DR. DAINES: We had 2.4.D, but that is rather limited. It does not occur now nearly to the extent it did a few years ago.

And then a few times we have had injury we have not been able to diagnose.

I mean, it seems to me that the problem of air pollution will be one which will be a changing problem, as processes and products vary. We will find different air pollutions, and each one will present its own problem. We have some we have not yet solved.

MR. MACAULAY, Q.C.: But do you think they are air pollution, rather than disease?

DR. DAINES: They are not disease. I am a plant pathologist, and we have gone through enough tests, made enough experimentation to convince ourselves that disease is not part of the picture.

The regular ground pattern is such that we strongly suspect that it is air pollution.

DR. EVIS (Secretary): Do you have any instance of dust from cement plants or lime dust coming out of chemical plants?

DR. DAINES: Yes, we have had two or three experiences of that type. In New Jersey we



have a plant which emits lime dust perpetually, and quite a large area is affected by the fall-out, and with our soil so alkaline, many of the minor elements are made so unavailable to the plants that they suffer from minor element deficiencies. Not direct burns from the element itself, but rather it causes little deficiencies to occur.

MR. MACAULAY, Q.C.: Some things just do not like to grow in alkaline soil.

DR. DAINES: That is right.

MR. MURDOCH: What are the manufacturing plants you are talking about? What is the end product?

DR. DAINES: Right now I cannot tell you. It is in Cape May, the southernmost tip.

DR. SACHS: It is a cleaning process.

DR. EVIS (Secretary): Is it the American Cyanamid Company?

DR. DAINES: I do not think so.

DR. EVIS (Secretary): Do you have any branches in this State?

DR. DAINES: Yes.

DR. EVIS (Secretary): Do they cause trouble?

DR. DAINES: We had one we suspected



of a very local dispersion.

MR. MURDOCH: It is a rock-crushing process, I suppose?

DR. DAINES: No, this one is not. But we have had problems about rock-crushing apparatus.

MR. MURDOCH: Are you familiar with the one at Saraguay, N.Y.?

MR. MACAULAY, Q.C.: I think I remember. They were processing an imported bone there.

THE CHAIRMAN: So many of our rural friends are not taking an interest in the matter of air pollution at all. They say it is something that is strictly the responsibility of the urban people.

I think all these things you have just mentioned - and in confirms what we heard when we were in California - prove that air pollution is of interest to the farmer and to the rural dweller just as much as it is to the rest of us.

When it begins to affect his livelihood, his stock and his crops, it is about time to take an interest in it.

DR. DAINES: I feel this way - Mr. Munroe may feel differently - that agriculture



is one of the few phases of the activities of departments which are interested in air pollution, which can right now definitely prove air pollution, and that since that is so, at the present time at least, they ought to have quite a big share of attention.

There is another type of air pollution we have, upon which I would like to make a comment.

Recently we have had turnpikes built through our States, and there was rock crushing and an asphalt plant for the production of materials to make the road bed. Around the plants there was quite a bit of dust, dust which was rather high in calcium carbonate.

In one area tomatoes were grown rather extensively around this plant, and we made a close field study, and found the tomato fields close to the plant bore very few fruits. This dust material was being deposited on the stigma, the material that receives the pollen and fertilizes the ovum and produces results in the tomato fruit; and this material deposited on that area was making fertilization rather unlikely.

We saw no evidence of foliage burn,





no evidence of flower damage, no microscopic evidence, but that was occurring. So air pollution may affect agriculture in ways of which a person may be entirely unaware.

I think the case in Los Angeles is another good one, where they took two greenhouses and grew plants in each greenhouse, put the City air through one and purified air through one. In neither house are the plants marked. They do not exhibit evidence of foliage burning. But in the house where purified air is used they will get maybe one third larger plants, - a third more vegetation.

In other words the Los Angeles smoke is harmful, without showing markings which are visible to the eye.

MR.MACAULAY,Q.C.: Also would it not be true that they might get one third loss of the crop by way of reproduction over a period of years; there might be a manifold change?

DR. DAINES: That is something that would require investigation. It may be so.

MR.MACAULAY,Q.C.:So it may be more dangerous than just the loss of today's crop.

DR. DAINES: For example, citrus



plantings, where trees are involved, they may be subject to various other types of pollution.

MR. ELLIOTT: Do you not think that human beings eating fruit from the trees may be affected too? They are not getting the same type of vitamins.

DR. DAINES: The changes are not understood. I do not think we can answer the question on the basis of what has occurred.

DR. SACHS: Some of these plants which you are testing for air pollution are much more sensitive indicators of pollution than human beings are. Damage to plants will appear when sulphur dioxide concentration may be at a level of 0.5 parts per million.

MR. MACAULAY, Q.C.: 0.3.

DR. SACHS: On sensitive plants it will be even lower.

As far as the average human is concerned, you do not even get people beginning to be conscious of it until it rises to a level of 3 parts per million of sulphur dioxide. This partly answers one of the questions raised before, - the so-called maximum allowable concentration to which our workers can be exposed



for sulphur dioxide is 10 parts per million. That is why you have to be a little careful working in places where you are dealing with fairly high concentrations.

One of the reasons for that is that human beings become a little bit habituated to sulphur dioxide. If we walked into a sulphuric acid plant where the concentration was 7, 8 or 10 parts per million, we could not stay very long, but the people who are working there can work there quite easily.

There have been a great many occupational health studies on these people, and it does not seem to affect them at all. We may find that one or two get a little infection of the nose and have to leave, but these people can work eight hours a day for a normal week, for several years of their lives.

If anything, sulphur dioxide has been proved to be a little bit antiseptic. Some of these people in some of the survey studies have less colds and less sinus trouble; and as I have said, absolute typical damage from sulphur dioxide in plants has been shown at 0.3 parts per million. If you compare that with your 10 parts per million



for your industrial worker, you will see that you have a much more sensitive index in your plants.

I do not know what it is in Ontario, but the analogy we use all the time is salt water. For instance, salt mist in the air will damage paint, car bodies; and, except for a very few specific types, it is hard to raise nice flowers in our beach areas.

Yet, one of our biggest industries in New Jersey is our recreation industry, with people going to the shore just for the privilege of bathing and living in this salt air. A clean baby does not react to soil and moisture the same way that many plants do. You can kill a plant by putting enough sodium chloride on it. But you have to be very careful in your analogies.

Dr. Daines, dealing with plants, has much better information and much more specific data to support what he says about them than some of our ideas about these things. We do not like certain things, but we have not anything like the proof he has.

DR. DAINES: Vegetation lends itself to experimentation much better than humans.





MR. MACAULAY, Q.C.: Doctor, we have heard views from you on matters we have never heard of before. You have emphasized what happens to cattle. I am interested in knowing what are the affects on other animals, - pigs, chickens, and so forth.

DR. DAINES: I think there have been claims made against industries on the basis of injuries to chickens. I think that research pretty well indicates that the injury is pretty much limited to cattle. Apparently cattle are much more sensitive to fluorine than are other forms of life.

MR. ELLIOTT: It does not affect chickens, dogs, cats, turkeys?

DR. DAINES: No.

DR. EVIS (Secretary): Not unless they get a big dose?

DR. DAINES: A large enough dose would affect anything.

MR. ELLIOTT: But not to the same extent as with cattle?

DR. DAINES: Cattle are much more sensitive. There is a big variation which exists in animal and plant life in their susceptibility



to injury. For example, the ragweed plant will grow right up against a factory that is emitting fluorine without showing any injury. We have just completed a fumigation. Whereas we marked quite badly a variety of gladioli with half a part per billion, in a fumigation that lasted ten days. At half a part per billion we damaged a variety of gladioli. Other plants grown in the fumigation chamber at the time showed no markings whatever.

MR. MACAULAY, Q.C.: Is there anything you can say about other groups, things other than vegetables and fruit? What about wheat and the different crops?

DR. DAINES: We have had very little experience in our State with wheat.

DR. SACHS: There has been work on corn has there not?

DR. DAINES: We have worked on corn. Corn is very sensitive to fluorine. Alfalfa is very sensitive to  $SO^2$  - the sulphur fumes; and I know that in the West,  $SO^2$  is a problem; they are continually observing wheat and other cereal crops. In other words, they are among the moderately sensitive group.



MR. MACAULAY, Q.C.: Would you say that no slaughtered animals, other than cattle, are affected except in excessive concentrations of things like fluorine, and the others?

DR. DAINES: So far as I know, that is so.

MR. MACAULAY, Q.C.: So there would have to be an unusual concentration? That does not mean a heavy one, but more than normal?

DR. DAINES: Yes.

MR. MACAULAY, Q.C.: If that is the case, would it affect the quality of the butter, for instance, or the milk?

DR. DAINES: I do not know the answer to that.

THE CHAIRMAN: This information you are giving us is not restricted to the State of New Jersey? You are talking of across the country?

MR. MACAULAY, Q.C.: Some of it is from his own experiences at Rutgers University.

What kind of grants does the State Government make available for this kind of research at your university?

DR. DAINES: When the farmers first requested an appropriation, they told the Appropria-



tion committee we could take up to \$15,000. a year from the unexpended balance of the experimental station fund. If they did not have an unexpended balance we were out in the cold.

MR. MACAULAY, Q.C.: What is it now?

DR. DAINES: I do not know the answer to it now. Now it is in the whole experimental station budget and left to the Director to apportion to the various items he has.

MR. MACAULAY, Q.C.: Could you give any indication?

DR. DAINES: Right now I have two young ladies with their Master's degrees in physiology and chemistry who are working about three-fourths of the time on air pollution, and I would estimate my own time at about one-fourth. That is about the size of the project.

MR. MACAULAY, Q.C.: And the equipment?

DR. DAINES: Our equipment? Perhaps we have spent \$15,000.

MR. MACAULAY, Q.C.: In ten years?

DR. DAINES: Yes.

MR. MURDOCH: Are there any Federal funds available for a matter of this kind?





DR. DAINES: There are, but we have not received any.

MR. MACAULAY, Q.C.: What universities are there in New Jersey other than Rutgers?

DR. DAINES: Rutgers is the only one working on air pollution. But there are several other universities here, - Princeton and so forth.

MR. BELYEA: Do you use any of these weed indicators produced by Stamford Research Institution?

DR. DAINES: No. We do not think too much of them.

First of all, as I said, our work is largely in fluorine, and we are producing burning at half a part per billion, and they use about five parts per billion, and at that concentration everything should burn. Their concentrations are so unrealistic that they have no value.

Where we have had our greatest experience we feel that the concentrations they use in their tests never occur in nature. But we found this; if you fumigate meadows, say at one part per billion, you will get one set of symptoms; if you increase it to one-tenth of a part per million, you will get an entirely different set



of symptoms.

So, therefore, you cannot place too much confidence in these tests.

MR. MACAULAY, Q.C.: Therefore, you have a problem in this research, not only of the air pollutant itself, but varying in the symptoms according to the concentrations?

DR. DAINES: Yes. The big problem from our point of view has been to provide a fumigation experiment where the gas is present in sufficiently diluted concentrations.

MR. BELYEA: Have you an alternative suggestion as to how you could go out in the country and see if damage is done?

DR. DAINES: I think we are on the right track. What we do, when we are called in on a suspicion of gas or air pollution, is to investigate the area to determine, first of all, whether it appears to be caused by air pollution or some other cause - insects, draught<sup>or</sup>/frost; and if we feel it looks like air pollution, then we study the plants involved which are responding, and certainly we can say that one group of plants is much more sensitive to fluorine than they are to sulphur, and if we find that the fluorine-



sensitive plants are the ones which are responding, we can have a pretty good idea it is fluorine.

On top of that, before we arrive at any definite decision, but having a general idea that it may be some new pollutant -- we gather samples, bring them in, and make a chemical analysis.

MR. MACAULAY, Q.C.: Who refers the matter to you?

DR. DAINES: Council agents, farmers themselves, people involved. We have some come to us from the State Department.

MR. MACAULAY, Q.C.: You are a sort of "Agricultural Dr. Anthony", are you not?

DR. DAINES: In a sense.

MR. BELYEA: If you had the money available would you put out indicator plants like gladiolus at various points around the State?

DR. DAINES: Well, I recommended to one of our refineries which was having trouble with fluorine that they take indicator plants and plant them at various distances from their plants, all around, and make observations of the indications as to how successful their control equipment was, and if they see an injury,



then an analysis should be taken to be sure that what they see is what they thought it might be; and so forth.

MR. BELYEA: Are you prepared to specify particularly a group of plants for that purpose?

DR. DAINES: I think we know the ones which are most sensitive.

THE CHAIRMAN: I do not want to break into this discussion, but if you want to be at lunch at one o'clock, be out at two and be in New York by three-thirty, we may have to think of breaking this off.

DR. SACHS: Before we leave here, Mr. Munroe, put down on the blackboard the steps the law says we have to take before assuming that a violation has occurred, and that we have finally to resort to court proceedings.

MR. MUNROE: I was asked the question, "How do you feel about this enforcement procedure?" My answer must be a little bit vague, because I really do not know yet. We have to go through this procedure:

- (a) Citing the violator.
- (b) Conference procedure.





(c) Allow a period of time.

After that, a formal hearing before the Commissioner of Health.

Out of that hearing comes a period of time, and after that period of time either there is compliance or violation.

At that point, if the violation still exists, there is court action.

The reason we have not had enough experience to evaluate it yet is that we have had about 115 violations: approximately about 60 have come to the point of conference and conciliation. Most of them are operating in this area where they have that period of time.

At the moment we have only four moving in this general direction; they have not reached a hearing yet; the process is being set up.

In order to answer intelligently how this works we would have to go all through this first.

THE CHAIRMAN: That covers everything.

There happens to be two or three farmers on our Committee, and what you have said is of particular interest to them, and I know will be of real interest to us when making our



recommendations.

DR. DAINES: It has been a pleasure for me to meet with you. I am a plant pathologist, and I was assigned to air pollution because one of the crops I worked with was involved, and the disease was one which affected tree fruits, and also sweet potatoes.

Right now we are in the harvesting of sweet potatoes; I have experiments going on, and I feel I need to get to them.

As I said, it is a pleasure to meet with you. You may be interested to know that our project at the New Jersey Agricultural Experimental Station, or at Rutgers, was the first project of that type in the United States.

Before that, air pollution as it affected agricultural research was conducted by industry, and a little by the United States Department of Agriculture; but ours was the first State project.

MR. MACAULAY, Q.C.: You are a good salesman, Doctor.

THE CHAIRMAN: Thank you very much.



---The further proceedings of this Committee  
adjourned (following a luncheon) until  
Friday, October 26th, 1956, at 10:00 o'clock,  
a.m.

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